A TREATISE

ON

PATHOLOGICAL

ANATOMY,

By G. ANDRAL,

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ROYAL ACADEMY OF MEDICINE, OF THE COUNCIL OF HEALTH,
ETC. ETC.

TRANSLATED FROM THE FRENCH
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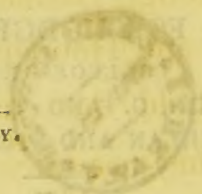
TRANSLATOR'S PREFACE.

The science of Morbid Anatomy has been cultivated in France with unprecedented zeal and success during the last thirty years, as may be abundantly proved by reference to the works of Corvisart, Bayle, Laennec, Broussais, Lallemand, Rostan, and Andral, which now form the text-books of pathological medicine all over Europe. Let me not, however, be understood as wishing to undervalue the labours of British pathologists, or to insinuate that they have not contributed their proportion to the general fund of pathological science. The names of Abercrombie, Armstrong, Baillie, Bright, Cooper, Farre, Hodgson, and Hooper, are of themselves sufficient to uphold the character of British pathology; but they are only a few of the many who in this country have distinguished them-

selves by the success of their pathological investigations. Our Periodicals abound with excellent essays and monographs ; but since the days of Baillie we have had no regular treatise on the subject, with the exception of Dr. Craigie's Elements of General and Pathological Anatomy, which does not, in my opinion, supersede the necessity for a treatise on pathological anatomy, written by an original observer, and professing to give a faithful account of the present state of the science in that country where it has certainly been most successfully cultivated. Dr. Baillie's Treatise on Morbid Anatomy has been translated into the French, German, and Italian languages, and has deservedly enjoyed the highest reputation in this country since the period of its first publication. His descriptions of morbid appearances are excellent as far as they go ; but, as a treatise on Morbid Anatomy, the work is totally inadequate to convey a just idea of the present improved state of the science.* To

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* Dr. Baillie states that he never saw but one instance of a hepatized lung, and that even that was in a preparation. It would be difficult to explain how he could have opened such a number of bodies without ever once

establish this assertion, I need only allude to the important additions that have been made since the time of its publication, to our knowledge of the morbid anatomy of the viscera of the three great cavities.   The pathology of the abdominal viscera was never fully understood, nor its importance appreciated, until the attention of the Profession was directed to the subject by the writings of Broussais ; the diseases of the cerebral organs have likewise received considerable elucidation from the researches of Lallemand and Rostan ; and the name of Laennec is inseparably associated with the accurate knowledge we now possess of the different morbid alterations of the thoracic viscera : indeed, by his successful labours, our knowledge of pulmonary disease has been brought to such a degree of precision, that medicine may now (at least in this department) fearlessly assert its claim to be ranked among the positive sciences.

Besides the authors whose names I have just

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finding a morbid alteration with which every tyro in morbid anatomy is now perfectly familiar, unless we admit that diseased appearances are much better understood now than they were at the period when he wrote.

enumerated, and whose writings are all of later
date than Baillie's, there are at the present day
in Paris several physicians of talent and infor-
mation, who literally devote their lives to the
cultivation of this essential branch of medical
science.   The names of Louis, Bouillaud, Gen-
drin, and Reynaud, are familiar to every patho-
logist : as it was my good fortune to spend some
time in the society of these gentlemen, I gladly
avail myself of this opportunity of bearing my
testimony to their enthusiastic zeal for the in-
terests of science, their indefatigable industry,
accurate observation, and faithful and unexag-
gerated representation of the results of their in-
vestigations.   The immense number of facts
collected by their united exertions forms a rich
mine of pathological knowledge ; but unfortu-
nately these facts have hitherto been consigned
to, or rather buried in, such a multitude of pe-
riodical publications, that they have been com-
paratively unavailable to the interests of science.
To collect these scattered facts, to add to them
the results of his own observations, and to ar-
range the whole into a system of pathological

anatomy, forms the principal object of the present work. For this arduous task few persons could be better qualified than Professor Andral: placed by acclamation at the head of the Pathologists of the French school, he may be considered as the chosen organ of that body, and consequently as expressing the present state of the science in that country. He has himself made, perhaps, a greater number of *post mortem* examinations than any other pathologist in Europe ; accordingly, his work is unrivalled in the number of original observations it contains,* and I can assert from experience, having myself made within the last few years a very considerable number of dissections, that nothing can exceed the accuracy of his descriptions. But, M. Andral has not confined himself to the

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* As an instance of the extensive scale on which his pathological investigations have been conducted, I may observe, that he introduces his description of the morbid alterations of the lymphatic vessels, by stating that he examined the thoracic duct in *six hundred* individuals. The number of positive facts collected by one who has enjoyed such extensive opportunities of observation are evidently worth all the theoretical reasonings of the literary compiler, who obtains his knowledge of morbid appearances from books, and compounds his elements of pathology in the study.

irksome task of merely enumerating the various physical alterations that take place in our organs; he has likewise endeavoured to investigate the origin of these alterations, to explain the mechanism of their formation, and to trace their mutual relation and order of succession. In his investigation of these important points, he has laboured to restrict the influence of inflammation within rational limits, and successfully combats the absurd doctrine, that every alteration of the living structure depends on an exaltation of its vital powers. He also examines the influence of these local alterations in the production of disease, and endeavours to point out how far the knowledge of these lesions may serve to aid us in determining its seat and nature, and to afford us certain data for the rational treatment of it. In short, he has attempted to combine pathology with morbid anatomy, and to deduce from their combination such conclusions as may serve to furnish us with more correct ideas of the nature of disease, and more fixed and rational principles for its treatment. In pursuing this investigation, he does

not allow his judgment to be warped by any favourite theory.   He admits the influence of the solids in producing the phenomena of disease; but he likewise accords considerable importance to the alterations of the fluids : he admits that local disease is capable of producing general or constitutional disturbance ; but he likewise maintains that those general agents, the blood and nervous influence, may be primarily affected, and that in this way general disease may precede the existence of any local affection.   These few instances may serve to shew that the work is written in the purest spirit of eclecticism ; indeed it appears a constant object of M. Andral's solicitude to reconcile the jarring interests of adverse doctrines, to select what is of real value from every theory, and thus to profit by them all, without wedding himself to any.   The value of a treatise on Morbid Anatomy written on these principles by an author so eminently qualified for the task, is too evident to require demonstration.

It now only remains to offer, in the name of my colleague and myself, a few remarks in our capacity of translators.   Convinced that the

first duty of a translator is to be faithful to his text, we have made this the constant rule of our practice ; the only instance in which we have ever even apparently deviated from it, being in the curtailment of a few cases which the author copied from other writers, and of an article on the pathology of the teeth, which was likewise extracted from the work of M. Serres. With these exceptions, we profess to give a full and fair translation of the original ; and as we are each more especially accountable for the parts we have respectively translated, we wish to add, that the first volume was written by Dr. Townsend, with the exception of the Preface, and the last 193 pages, and that in this volume, all the articles were translated by Dr. West, except those on the morbid alterations of the circulatory and respiratory apparatuses, from page 296 to page 568 inclusive, which were translated by Dr. Townsend.

<div style="text-align:right">R. T.</div>

Merrion-square,
Nov. 19th, 1830.

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ERRATA.

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Page   xi, line 2 from bottom, *for* undivided *read* individual.
—— 216, — 4, *for* mucous *read* muscular.
—— 247, — 1, *dele* cirronosis.
—— 250, — 6, *idem*.

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Page   49, line 4, *for* hyperæmia *read* the hyperæmia.
—— 120, — 3, *for* of the *read* of a.

PART II.

SPECIAL

PATHOLOGICAL ANATOMY.

A TREATISE

ON

MORBID ANATOMY

AND

PATHOLOGY.

PART SECOND.

SPECIAL PATHOLOGICAL ANATOMY.

It is my purpose, in this second part, to describe the morbid states of the several apparatuses, considering the lesions they may present particularly with regard to the pathology of the interior.

DIGESTIVE APPARATUS.

This apparatus is composed of two distinct parts; the one situated below the diaphragm, and the other above it. I shall devote a separate section to the diseases of each part.

SECTION I.

DISEASES OF THE PORTION OF THE ALIMENTARY
CANAL BELOW THE DIAPHRAGM.

Four grand periods may be distinguished in the history of medicine, as regards the manner in which the diseases of the alimentary canal have been considered with respect to their nature. In the first, and longest of all, which commenced at the time of Hippocrates, and terminated almost in our own, pathological anatomy was either totally neglected, or else badly applied; and the nosologists, grouping symptoms artificially together, made so many distinct diseases of them; so that each morbid phenomenon was considered as a separate affection. In the second period, comprising particularly the works of Bayle and Laennec, pathological anatomy banished those classifications of diseases by symptoms: thus, from that out, the history of vomiting, or of dyspepsia, for instance, was no longer separated from that of the lesions that produce them. In like manner, however, as distinct diseases had for a long time

been composed of symptoms artificially grouped, so now, Laennec and his disciples composed in their turn artificial groupes in pathological anatomy, if I may so express myself. Being struck chiefly with the difference of form and appearance of certain lesions, they did not perceive that these different lesions were often the termination of the same morbid state, which, many times at least, should be put in the first rank, as being the source and connecting tie of them all. Considering these lesions only, they were naturally led to regard as essentially different with respect to their causes, many which differed only in their forms. Thus, in their nosological scale, they placed cancer of the stomach and chronic gastritis at a great distance from each other. The third period dates its existence from the doctrines of M. Broussais, who maintained that certain lesions of the alimentary canal most dissimilar in appearance had yet the same origin ; and that a slight red or brown thickening of the mucous membrane of the stomach, and a vast ulcer of the same membrane, or a scirrhous induration of the subjacent nervous tunic, should equally be referred to an augmentation of the organic action of the tissues : but, I would ask, does that hold good in all cases? I think not ; and a fourth period has already commenced, in which, combining the

exclusive theories of the two preceding, while we acknowledge with Broussais that irritation is the common tie which unites many gastro-intestinal lesions, though until his time it had remained unsuspected, we yet are beginning to be convinced, 1. that irritation does not constitute the whole phenomenon ; 2. that sometimes it is its source, and sometimes only one of its elements ; 3. that if we attempt to account by irritation solely for the special nature of morbid productions, we must necessarily admit that it differs much less in its degrees than in its modes ; 4. and lastly, that in many cases, even the existence of irritation is not demonstrated.

CHAPTER I.

Of the Alimentary Canal in the healthy State.

There has been hitherto so little agreement on the subject of the natural appearance of the stomach and intestines, that I consider it indispensable to determine accurately what is the anatomical condition of the alimentary canal in the healthy state. Perhaps one circumstance which has long been an obstacle to the ascertainment of this point, is the great frequency of

gastro-intestinal alterations.   As there are very few subjects in which some of these are not met with, anatomists had become accustomed to consider them as belonging to the natural state of the parts; and they seemed the more warranted in doing so, as, until very lately, the symptoms produced by these alterations were either totally unknown or ill understood.

If we examine the internal surface of the stomach or intestines in a living animal, that is not struggling, and whose circulation is not disturbed, we find it of a red tint somewhat deeper than that of the mucous membrane of the cheek in a healthy man.   If we examine the same animal after death, we find that this red tint has disappeared, and that the surface is now uniformly pale, or, at most, very slightly rose-coloured.   In order that the experiment should afford these results, the animal must be deprived of life in such a manner as not to lose too much blood, on the one hand, as the natural paleness of the intestine would then be increased ; or to die in a state of asphyxia, on the other, as the mucous membrane would then be mechanically injected; which, though not a morbid, would yet not be the natural state.

I think we may conclude from this experiment that, after death, the mucous membrane

of the stomach and intestines tends to lose its colour like the skin.

There have been frequent opportunities of examining bodies in cases of accidental death, where the individual was apparently in the enjoyment of perfect health a few minutes previously. In most of these cases, also, the alimentary canal has been found free from any red tint.

Sometimes, however, different degrees of injection have been observed on the internal surface of the stomach or intestines, as well in animals supposed to be sound, that were sacrificed to physiological experiments, as in men in cases of accidental death. To this it may be answered in the first place, that if the alimentary canal has been found oftener without any redness, under the same circumstances, it is very probable that in the cases where the redness was observed, it arose from disease. But, besides, the appearance of the parts that were found injected should have been described with more care and precision; and a detailed account should have been given of the kind of death the animals suffered, and of the space of time that had elapsed between the accident and death in the other cases.

There are, in fact, certain circumstances under the influence of which the alimentary canal

though free from disease, may yet present various degrees of red coloration in the dead body. Of these circumstances, some may have operated a certain period before death, others only during the last moments, and lastly, others either soon or at some length of time after the cessation of life.

Of the causes which operate before death, some are physiological and others pathological. Thus, it is an undoubted fact, that, during the process of chymification, the internal surface of the stomach acquires a considerable degree of redness; as well as that the small intestine does the same while the separation of the chyle is taking place in it : any one may convince himself of the truth of these assertions by examining living animals. But, besides, it has been ascertained by observation that this redness that is produced by digestion continues after death ; so that on opening the body of any individual that has died while chymification or chylification was going on within him, we shall find those portions of the alimentary canal in which the process had been taking place of an unusually high colour.

The pathological causes are all such as act by presenting some obstacle to the free return of the venous blood from the gastro-intestinal parietes to the right cavities of the heart. There

happens then to the mucous membrane of the alimentary canal what happens to the skin in persons who die of asphyxia : in such cases we observe the cutaneous surface long before death acquiring a constantly increasing colour from the venous blood ; now, what takes place in the skin must also take place in the intestine. We may assure ourselves directly of this by examining a coil of intestine in an animal who is slowly suffocating, when we shall find that, as the respiration becomes more difficult, the coil assumes a more intense and uniform red hue. Lastly, if, as Boerhaave did long ago, we prevent by a ligature the circulation of the blood in the trunk of the vena portæ, we shall observe the whole of the internal surface of the intestines assuming a fine red tinge, which is compared by Morgagni to the colour of cochineal ; and sometimes, even, blood transudes through the parietes of the distended vessels, and fills the intestine. These facts being known, it is only drawing the conclusion from them to establish that, every time the blood cannot return freely from the capillaries of the intestinal mucous membrane to the venous trunks, that membrane will continue coloured after death. Hence arise the various shades it presents in cases of strangulated hernias, for instance, or of obstructions of the liver, of tumours situated on the course of

the principal divisions of the vena portæ, of ob-
literation of the vein itself by old coagula, and,
lastly, of organic affections of the heart. If,
however, there was but little blood in the body,
whether through defect of sanguification, or
in consequence of recent copious bleedings, a
considerable obstacle to the venous circulation
would produce a less intense coloration of the
alimentary canal, than that which would arise
from a slighter obstacle existing in a person
whose vessels contained a great deal of blood a
short time before death.

The red coloration of the gastro-intestinal
parietes in consequence of some mechanical
obstacle to the venous circulation, presents va-
rious degrees of intensity. In the lowest of
these, the submucous cellular tissue alone is co-
loured, but not in its capillary network ; it is
traversed in various directions by bluish veins of
pretty large calibre, which cease to be injected
on ariving at the mucous membrane, while their
other extremities are continuous with the me-
senteric veins, which are themselves equally
gorged with blood. In a higher degree of in-
jection, depending quite as much on mechanical
causes as the preceding, the mucous membrane
itself begins to assume a tinge, and, according
to the size, number, and relative situation of
the injected vessels perceptible to the naked eye,

it exhibits either simple branches separated by large colourless intervals, or ramifications of greater or less extent, produced by the injection of the smaller vessels, or, lastly, a redness considerable enough to produce a complete opacity of the parietes wherever it exists. According as these various shades of colouring are extended or circumscribed, the result will be either a diffused redness of the intestine without any precise limits, or else streaks, stripes, patches, or mere points.   In fact, there is not one of these appearances that may not be produced by a simple injection from a hyperæmia either mechanical or passive ; and he would be strangely mistaken who should imagine that the dotted redness, for instance, more necessarily announces an active hyperæmia, than does the simple congestion of some of the submucous veins. In these different cases, on attentively examining the injected parts, we may perceive that the injected vessels are directly continuous with the great veins subjacent to the mucous membrane, just as these latter are continuous with the mesenteric.

If the obstacle to the return of the blood from the intestines to the heart is still more considerable, or if, what comes to the same thing, the obstacle not being increased, there is an increase of blood in the vessels, that fluid

escapes from them, and becomes effused, either into the submucous cellular tissue, where it forms ecchymoses, or into the cavity of the intestine itself, where it communicates a reddish tint to the bile, mucus, or other matters that happen to be contained in it. The facility with which a liquid or gaseous injection may be made to penetrate into the intestinal cavity when driven into the mesenteric veins from the trunks towards their branches, explains how, under the influence of a considerable congestion of the same veins, a part of the blood contained must have a tendency to escape into the interior of the alimentary canal.

Thus, on summing up all that we have learned both from simple physiological reasoning, experiments on animals, and the examination of dead bodies, we are led to conclude that the gastro-intestinal mucous membrane may be indifferently white or red, without either of these colours necessarily indicating that the membrane had been in a morbid state; it is either white or red, of various shades, according as there has existed before death some one of the conditions, mechanical, organic, or vital, which we have endeavoured to explain. Now, as those which produce the red coloration exist the most frequently, it follows that, in the dead body, we should more frequently find

the alimentary canal injected than colourless. But that is not all : after life has ceased, new causes arise which tend to produce new modifications in the colour of the intestines, and to inject some parts of it much more strongly than they were at the moment of death. The causes of redness produced after death may be reduced to two principal ones : one, the weight of the blood, and the other, its transudation through the parietes of its vessels.

The first of these causes begins to act immediately after death. The reality of its existence has been fully proved by MM. Trousseau and Rigot, in a memoir abounding in interesting facts and ingenious views.

If we fix to a nail the two united extremities of a coil of intestine supplied by veins gorged with blood, we shall perceive, after a short time, the most dependent part of the coil, constituting the middle of the convexity of the curve thus formed, assuming a very marked red colour, while the less dependent parts become paler and paler, and the mesenteric veins get rid of the great quantity of blood they contained. This experiment proves that the blood contained in the vessels of the intestinal parietes, provided it be liquid, changes its place after death, and tends to accumulate in those parts of them where it is attracted by the laws of gravitation. Now,

if this takes place in a coil of intestine separated from the body, it must occur equally in the interior of the abdomen, where the same physical law must also act. To settle this point, MM. Trousseau and Rigot began by placing the bodies in such a situation that the influence of gravitation should be beyond all doubt. Thus, upon leaving in a vertical position for several hours the bodies of some dogs that had been previously strangled, they ascertained that, in those parts of the intestines that had been thereby rendered very dependent, the mucous membrane was of a lively red, its villi were strongly injected, blood was effused into the interior, where it tinged the bile and the mucus, and there were ecchymoses in the submucous cellular tissue. In other dogs which had likewise been strangled, but were then placed on the belly, the portions of intestine which were most dependent in this new position were most highly coloured. In horses killed by cutting the spinal cord, and placed afterwards on their back, but yet so that the bodies were sometimes more inclined to the right, and sometimes to the left, they found in like manner that the coils which were the most strongly injected, nay, the only ones which were so at all, were those in which the law of gravitation should have exerted its greatest influence in these various positions.

They also remarked, in the course of their experiments, that those which were shrunk and contracted, so that their vessels were doubled on themselves, were not injected, although placed in a dependent position. In the horse, on the contrary, the superior portions of intestine, *which were remarkable for their great diameter*, were found to have their under side injected frequently enough. If, on opening the body of an animal which has just died, we fix certain portions of the alimentary canal in a dependent position, and examine them again some time afterwards, we find them injected, though they were not so at the time of the first examination. M. Trousseau tells us he opened, six hours after death, the body of a man who died of a typhus fever : on examining some dependent parts of the ileum they appeared to have a slight red tint, while the superior parts were, on the contrary, colourless : the intestines were then replaced. Next morning, on examining those dependent coils which had not been opened the preceding day, as well as those which had been partially so, he found them full of mucus coloured by the blood, which had imparted a violet tint to their internal membrane. These facts fully confirm my own observations. For this long time back, while examining the bodies opened at *La Charité*, I have constantly been struck with the circumstance that those

coils of the small intestine which are more de-
pendent than the rest, those, for instance, which
are sometimes found sunk in the hollow of the
pelvis, are also more strongly injected. It be-
comes a question whether this coloration from
hypostasis can occur in the small intestine only ;
it certainly can occur with more facility there
than elsewhere, by reason of its disposition, and
of that of the vessels distributed to it. I am,
however, strongly inclined to think that, in
certain cases, the redness observed on the
great extremity of the stomach, and on its
whole posterior surface in general, (that being
inferior in the subject,) results in like manner
from this accumulation of blood by hypostasis. I
am the more disposed to this opinion, from finding
it mentioned in my notes that, in a case where
a body had been laid upon the abdomen a short
time after death, preparatorily to opening the
spinal canal, and remained several hours in that
position, the anterior part of the stomach was
injected, and dotted with red, while the posterior
part was pale. At the time, I imagined it to
have been caused by gastritis ; but I should not
be apt to think so now.

The redness of the intestinal parietes that is
produced, wholly after death, by injection from
hypostasis, the reality of which I have just now
proved, presents various degrees or shades, like

the redness from congestion, either mechanical
or passive, that had been previously under con-
sideration.   Thus, we may find the villi highly
coloured, and even blood effused into the inte-
rior of the intestinal canal. This, however, very
seldom happens, except in experiments on ani-
mals that are strangled, and kept in the vertical
position for several hours after death.   In such
cases, in fact, every thing is most favorably dis-
posed for the blood's being drawn in the greatest
possible quantity to where it is attracted by the
law of gravitation. Nothing similar has ever
been observed in the horses killed by pithing,
or by knocking on the head ; and, in the human
subject, the determination of the blood towards
the most dependent parts of the alimentary ca-
nal most commonly produces in it only an injec-
tion more or less strong of the mucous mem-
brane or of the subjacent cellular tissue ; which
may produce either a diffused tint with an ap-
pearance of ramifications, or circumscribed
blushes in form of points, spots, streaks, &c.

Injection from hypostasis begins to take
place immediately after death, acquires its high-
est degree at the end of some hours, and ceases to
be continued as soon as the blood, having cool-
ed, begins to coagulate. Hence it follows that
in subjects whose temperature is long kept up
either naturally or artificially, and in which the

blood continues fluid, the injection of the intestines from hypostasis will be much more decided than under the opposite circumstances. It will also be more considerable when, after acute diseases, a great deal of blood still remains in the system ; and when, in consequence of a slow death, or of obstacles to the circulation, the intestinal veins were gorged with blood at the moment of the cessation of life.

As soon as a certain space of time has elapsed after death, a new cause of coloration begins to act : as soon as putrefaction begins to seize upon the body, the blood contained in the vessels, both large and small, of the gastro-intestinal parietes exudes through the membranes of those vessels, and is effused in variable quantities into the surrounding tissues, especially into the submucous cellular tissue. On this extravasation of the blood depend, for instance, the red spots almost always observed in the stomach along the veins of its great extremity, when the body is opened more than six and thirty or forty hours after death. These spots thus assembled along the course of the vessels are sometimes isolated, and sometimes grouped together and running into one another ; and in this manner mark the surface of the stomach with streaks and bands of various figures. If after having observed the stomach in this condition, we leave

it, and examine it again at a later period, we find that the redness has increased, and that, moreover, it appears in a new form : it no longer exists solely along the vessels, but the whole surface of the stomach presents a tinge which has a constantly increasing tendency to become uniform ; and a period at last arrives, when all the membranes, having become soaked with blood, are equally red ; they may then have a tint almost similar to that which we observe on the internal surface of the arteries when stained by the contained blood.   This kind of redness formed after death cannot, however, proceed to such a high degree, unless in cases where a certain quantity of blood existed in the vessels of the stomach at the moment of death ; and as, from the effects of gravitation, that fluid accumulates towards the great extremity of the stomach in particular, it follows that it is there we should see the redness from transudation most strongly marked.   It would be useless to attempt to fix precisely the period at which this transudation should commence ; for, in order to do that, we should fix precisely the period at which putrefaction commences.   Now, that period is very variable, as it depends, 1. on certain conditions relative to the body itself ; such as the kind of death, the nature of the disease that produced it, &c. ; and, 2. on certain external

circumstances, especially on the thermometrical and hygrometrical states of the place in which the body is. Accordingly, when, in summer time, we open bodies that have been kept, since death, in warm beds, and in rooms of a temperature at least as high as that of the external air, it is usual to find, so soon as after four and twenty hours, very evident marks of transudation in the alimentary canal : in such cases, for instance, I have often found all the membranes of the great extremity of the stomach of a uniform red tinge. Under similar circumstances, the colouring matter of the blood may likewise transude, spread over the internal surface of the canal, and mix with the fluids contained. I have ascertained this to be the case in most of the bodies I had occasion to examine in the very warm summers of 1825 and 1826.

The spleen, also, may suffer some blood to transude through its parietes; and this may then soak into the adjacent portion of the stomach and impart its colour to it. This kind of coloration, however, is less frequent than that which results from the transudation of the blood through the parietes of the gastric vessels. One of the circumstances that must have some effect in producing a variation in this cause, is, undoubtedly, the difference of the states in which the blood may be that is contained in the

spleen ; as the more liquid it is, the more rea-
dily must it soak through the enveloping mem-
brane of that organ.

Lastly, even at the time we are engaged in
examining the internal surface of the alimentary
canal in the dead body, we may often produce
in its mucous membrane, by scraping it with
the back of a scalpel, a redness which not only
did not exist during life, but which was not even
apparent before the scraping.   The effect of this
operation is to squeeze into the finest vessels of
the mucous membrane, and into a single point
in those, the blood which, being before that dis-
persed in the mass of the surrounding vessels,
was much less apparent : extravasation, even,
may be produced in this manner.   It is to be
observed that this artificial redness can be pro-
duced only when there previously exists a cer-
tain quantity of blood in the mucous membrane
or below it : it most commonly assumes a dot-
ted form.

When we plunge a bladder filled with blood
into different gases, the blood becomes singularly
altered in colour.   It follows that whenever
these same gases are developed in the intestines,
they must also affect the blood similarly through
the parietes of its vessels.   In some cases that
may occur a very short time after death ;
but these gases being in general produced only

by putrefaction, it is not until that process is tolerably advanced, that the gases resulting from it can modify the colour of the blood, and change into brown or green, &c., the red tint which existed during life, or was formed after death by hypostasis or imbibition.

The bile that is found in the alimentary canal after death in more or less considerable quantities, most commonly lines its internal surface without tinging it; but sometimes the yellow matter soaks into the mucous membrane, combines intimately with it, and produces a yellow tinge which cannot be removed by washing. This may exist only in isolated spots, or affect a great extent uniformly; and it is often found very strongly marked in the stomach, where bile does not naturally occur. More than once, for instance, I have found the whole internal surface of the right half of that viscus stained uniformly of a fine ochre colour. I am inclined to think that this may be owing to the presence of an acid in the stomach, which must have a tendency to separate from the bile its yellow matter, which in this free state is more readily imbibed by, and combined with, the adjacent tissues. It is thus that some explain the yellow tinge observed on the mucous membrane of the duodenum in certain cases of poisoning by sulphuric acid.

To sum up ; the gastro-intestinal mucous membrane is not of one constant and invariable colour in the healthy state.   It is perfectly white only in a very small number of cases, which I have mentioned.   Besides these it offers, without ceasing to be sound, different degrees of colouring, depending, 1. on the passive hyperæmia which has always a tendency to take place in the last moments of life in the parts abounding in capillaries ; 2. on mechanical obstacles to the venous circulation formed at a longer or shorter period before death ; 3. on the hypostatic accumulation of blood towards the dependent parts ; 4. on the transudation of the blood through its vessels ; 5. on another kind of transudation which may take place, in some cases at least, through the capsule of the spleen ; 6. on the presence of different gases in the alimentary canal at the moment of death ; 7. on the development of other gases, at a longer or shorter period after death, when putrefaction takes place ; 8. on the combination of the yellow matter of the bile with different parts of the gastro-intestinal mucous membrane ; 9. and lastly, on the accidental introduction into the alimentary canal of different colouring principles that may stain its internal surface, and thus produce a colour more or less perfectly resembling the result of a morbid state.

Of the colours produced by these different causes, some cannot be in any way confounded with that resulting from inflammation; others differ from it only by characters which are often but feebly marked; and, lastly, others, especially those mentioned under the heads 1 and 3, as also some varieties of those under the heads 2 and 4, exactly resemble the colour that would result in the alimentary canal from the irritation artificially produced in it by the introduction of a mineral acid sufficiently diluted with water to inject, without disorganizing, those portions of the tissues with which it comes in contact.

It is, besides, important to oberve that, *cæteris paribus*, the colour of the gastro-intestinal mucous membrane presents some shades, according to, 1. the part examined; 2. the age; and, 3. whether the process of digestion was going on or not in the stomach or in the duodenum and jejunum at the moment of death. Thus, in those cases in which the mucous membrane is found colourless in the adult, we may observe, as M. Billard has shewn us, that it is whitish in the stomach, of an ashy white in the duodenum and jejunum, that the ashy shade diminishes towards the end of the ileum, and that, finally, in the great intestine, the mucous membrane resumes its dead white colour. With

respect to age, we learn from the valuable re-
searches of M. Billard that the gastro-intestinal
mucous membrane is rose-coloured in the fœtus
and in the infant, and of a milky and satiny
whiteness in young persons; that, in the adult,
it assumes a slight ashy shade, especially in
the duodenum and commencement of the small
intestine; and lastly, that in old age this ashy
shade becomes more decided and general, whilst
the submucous veins, being dilated and filled
with blood, lift up and impart a colour to the
membrane covering them. At other times,
however, in old persons who die in a decrepit
and bloodless state, the mucous membrane is
remarkable for its extreme paleness. I am even
persuaded, that it is in old persons, and in very
young children that had died of marasmus, that
I have observed the internal surface of the ali-
mentary canal in the most perfectly colourless
state.

I have already spoken of the modifications
produced in the colour of this membrane by the
process of digestion.

The natural thickness and consistence of the
mucous membrane of the alimentary canal are
not less important to be determined precisely
than its colour.

This membrane, in its natural state, is far
from being equally thick throughout.   M. Bil-

lard has proved that the *maximum* of thickness exists in the duodenum, and the *minimum* in the colon. Between these two extremities we find, 1. the pyloric portion of the stomach, in which the mucous membrane of the stomach is almost as thick as the duodenum ; 2. its splenic portion, where its thickness is much less ; 3. the rectum; 4. the jejunum ; 5. the ileum. The great thickness of the mucous membrane of the duodenum depends principally on the numerous follicles distributed through it ; in the stomach, it is the body of the membrane itself which has an excess of thickness. M. Louis has attempted to measure exactly the relative thickness of the different portions of the mucous membrane of the stomach. Its thickness in the great curvature amounts, according to him, to three-fourths of a *millimetre ;* in the small curvature, from a third to three-fourths ; and in the great extremity, from a third to three-fifths, only. (A *millimetre* is .03937 of an English inch.) There are certain folds formed by the mucous membrane, both in the stomach and elsewhere, which contribute to an apparent augmentation of its thickness. Where these folds exist, it often happens that there is a more extensive redness found, than in their intervals ; this is observed, for instance, in the *valvulæ conniventes* of the small intestine. But when we separate

the two reflected portions of membrane that constitute each valve, by drawing asunder their base at each side, the unfolded membrane does not appear any redder than the neighbouring parts.

In the remarks I have just made on the thickness of the mucous membrane of the alimentary canal, I have supposed it to be examined in the body of a person that had died of an acute disease, and whose intestines were not gorged with too great a quantity of blood from one of the causes already pointed out. When that occurs, the thickness of the membrane may be increased by the blood which distends its vessels, without our being warranted in considering it as diseased on that account. On the other hand, in persons who die of marasmus, without having been affected with gastro-intestinal irritation, the mucous membrane of the alimentary canal becomes remarkably thin, falling into a state of atrophy along with the subjacent muscular coat : many other tissues are similarly affected, under the same circumstances. This attenuation is particularly remarkable in the stomach, whose mucous membrane, especially towards the great extremity, becomes reduced to an exceedingly fine kind of web. I grant that a membrane so attenuated as that is no longer in its physiological state, and that its

functions must be deranged ; it must digest but imperfectly, just as its muscular coat, under the same circumstances, must contract but imperfectly. At this degree, the attenuation of the parietes of the stomach becomes a morbid state ; but before it reaches that state we may observe many other degrees in which the diminution of thickness of the mucous membrane of the stomach is physiologically proportionate to certain states of the general nutritive action. Lastly, I think it probable enough that great varieties of thickness of this mucous membrane must occur in individuals, just as is the case with the cutaneous system, and as there are also differences of bulk in the muscular and osseous systems in various individuals.

The consistence of the gastro-intestinal mucous membrane is in general directly in proportion to its thickness. It is much more considerable in the pyloric portion of the stomach than in its splenic portion ; in the colon, where the thickness of the mucous membrane is at its *minimum*, its consistence is also very slight. In the stomach, we may allow the mucous membrane to be of the natural thickness, when, on making an incision in it, taking care not to cut the subjacent tissues, especially the nervous, or, more properly, the membranous coat, we can easily detach pretty considerable shreds of it with a

forceps : the shreds should be larger in the py-
loric than in the splenic portion.   In the duo-
denum its nature is such as not to admit of such
considerable shreds being detached as in the
stomach.   In the rest of the intestines, the rec-
tum excepted, the mucous membrane, even in
its natural state, breaks and tears whenever we
attempt to detach any portion of it.   In these
various parts, however, the same physiological
conditions which produce a variation in the
thicknes of the membrane, such as the quantity
of blood supplying it, and the general state of
the nutritive powers, produce a variation in its
consistence.   Thus, at the same time that this
membrane becomes thinner, it tends also to
grow softer, without the previous or present
existence of any process of irritation.

The mucous membrane of the alimentary
canal may, after death, be modified in its con-
sistence, as we have already seen it to be in its
colour.   This kind of softening has been ob-
served principally in two cases : 1. long after
death, when there were already signs of putre-
faction in the body ; 2. in a very short period
after death.

In the first of these cases the membrane
loses its consistence but slowly.   I have more
than once found it not in the slightest degree
softened in bodies of persons that had been from

eight to ten days dead, in which the intestines were green and distended with gases, while there was exudation of blood into them, together with ecchymoses in the substance of their parietes, and in many parts, emphysema under the membrane. After the tenth day its consistence diminishes, and it then softens gradually; from the fifteenth to the eighteenth day it becomes like pap, and from the twenty-fifth to the thirtieth it becomes quite undistinguishable.

This membrane, when exposed to the air, softens much more rapidly. M. Billard, after opening an intestinal canal, left it extended on a table for twelve days; the temperature of the room was ten degrees above zero, and the sun shone into it every day. The mucous membrane did not begin to soften until the sixth day, at which period putrefaction was already advanced; on the tenth day it was of a pultaceous consistence; and, on the eleventh, it was reduced to a very fetid greenish pulp.

On the contrary, this membrane, when removed from the influence of the atmosphere by being placed under water, softens but very slowly. M. Billard, after leaving a portion of intestine for two months in the same water, and not till then, found its mucous membrane perceptibly softened, though it still retained a certain degree of consistence. It was not till three

months had elapsed, that it was found to be so softened as to resemble merely a kind of very fetid purulent layer.

It follows from these facts that the *post-mortem* softening of the gastro-intestinal mucous membrane does not occur until the putrefaction is pretty far advanced, and after the usual period of opening bodies in most cases. It would appear, then, that we should not consider the very evident softening of the mucous membrane of the stomach, that is sometimes observed at from twenty to four and twenty hours after death, to have taken place after that event. However, the solution of this question is embarrassed, if I may say so, by some cases in which the mucous membrane of the stomach has been found completely softened, in dogs killed in very good health, and opened shortly after death. Similar facts have been observed by M. Bretonneau. M. Trousseau, who gives an account of them in the *Archives de Medecine* (tom. xii. page 345) adopts an opinion of Hunter's, who has numerous followers in England at the present day, and attributes this kind of softening to the solvent action of the juices secreted by the stomach. According to several English physicians, the softening might even extend to all the coats of the stomach, and produce a perforation of that viscus after death.

The arguments on which they ground their opinion are the following.

1. It has frequently occurred, that, on opening the bodies of men, and still more of various animals, the parietes of the stomach have been found singularly softened or perforated, although before death there had been no symptoms of any gastric affection, and most of them had been killed while apparently in the enjoyment of perfect health. Adams has found such perforations in the stomach of dogs; Carlisle and Cooper, in those of rabbits; and Spallanzani, in those of fishes. Before that, Hunter had found the stomach perforated in a prisoner who had starved himself to death.

2. In these cases no traces of peritonitis were discovered around the perforation; which should necessarily have occurred, if the communication between the cavity of the stomach and that of the peritoneum had been formed during life.

3. Doctor Allan Burns found, in a human body, the stomach perforated in that part where it is in contact with the liver. Having ascertained that the latter was uninjured, he proceeded, two days afterwards, to examine the parts anew, when he found that new changes had taken place; the portion of liver which supplied the place of the deficient parietes of

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the stomach was itself remarkably softened and broken down : still, there was as yet no sign of putrefaction in the body. In this case, as Mr. Burns observes, is it not evident that this kind of liquefaction of the liver was owing to the solvent action of the same juice which had previously attacked and destroyed a portion of the gastric parietes ?

4. From a young man of a sound constitution, who had a fistula of the stomach in the epigastrium, in consequence of a gunshot wound, Dr. Lovell, surgeon in chief of the armies of the United States, collected a certain quantity of juice which flowed out through the fistula. The juice, which was received in a bottle, was put in contact with some meat, when it was observed that it dissolved it with great activity from the surface to the centre : the meat, says the narrator of the experiment, dissolved like a piece of gum arabic when kept in the mouth. Now, if the gastric juice is so active as that, is it not easy to conceive that if, after death, it happens to be in the stomach in a certain quantity, and possessing certain qualities, it may dissolve the coats of that viscus, just as it dissolved the dead flesh, in the experiment ?

Are we then to admit, as proved by these facts, that the parietes of the stomach may be softened and perforated by the gastric juice

after death ? I think, myself, that the facts should be taken into consideration, but that they are neither sufficiently numerous, nor circumstantially enough detailed, for us not to wait for new observations on the subject to confirm or contradict the conclusion drawn from them.

As the follicles, both isolated and aggregated, that are distributed over the gastro-intestinal mucous membrane, play a principal part in its diseases, it is of importance to determine accurately what varieties of appearance they may present without yet ceasing to be in their physiological state.

In most adult subjects in which the alimentary canal does not appear to have undergone any alteration, very manifest follicles are found but in two parts ; namely, around the cardiac orifice of the stomach, and in the duodenum. Moreover, in the inferior portion of the ileum, there are certain spots found where the parietes of the intestine seem to the touch to be thicker than elsewhere, and, on being placed between the eye and the light, have not the usual degree of transparency. It it there that those aggregated follicles known by the name of *the glands of Peyer* make their appearance in other subjects.

In children the follicles are naturally more developed, and appear in a greater number of parts.

Thus, in them, even when there has been no indication of the existence of any intestinal affection, it is quite common to find on the internal surface both of the small and of the great intestine small round bodies, of a white or greyish colour, and with a central orifice, the circumference of which is very often of a deep grey ; which are, very evidently, nothing but follicles.   In many children, too, in whom the intestinal canal appears equally free from any morbid alteration, besides these isolated follicles, others are found crowded together, and lying close on one another in immense numbers, so as to form by their assemblage very large patches that may occupy an extent of from one to three feet in the small intestine.   In the centre of each follicle is often found a point of a bluish grey or black ; which produces a dotted appearance throughout the patch.   As I have found these patches (*the aggregated glands* of Peyer) thus far developed, and thus coloured, in children who died suddenly in consequence of accidents, or of diseases that had no relation whatever to the digestive apparatus, I think I may assume as a fact that they do not constitute a morbid state in childhood.   But are they a proof of disease in the adult ?   It is true enough that, in many persons that die of or with chronic diarrhœa, the most remarkable and striking

change found in the alimentary canal, is an un-
usual development of the follicles, resembling
what we have just now seen existing naturally
in children. Besides, in many other individuals
who died of some other disease while recovering
from gastro-enteritis attended with severe symp-
toms, such as are termed adynamic and ataxic,
I have often found on the internal surface of the
alimentary canal, near the end of the ileum, the
aggregated glands of Peyer appearing in the form
of vast patches dotted with black. I believe
that, in this latter case, the dotted patches dis-
covered on examination after death, indicated
that the follicles were in a state of hypertrophy,
resulting from the recent irritation that had
affected them. But this state of hypertrophy
might have continued without producing any
bad effect; as is proved by the fact that in
many other adults the follicles are found in a
similar state, although at the time of their death
there had been no sort of disease in the *primæ
viæ*. To conclude, then, I think that the great
development of the intestinal follicles is not a
natural state in the adult : it may result from
an antecedent process of acute inflammation,
and continue as a vestige of such process ; it
may also occur without any appreciable trace of
antecedent irritation, being connected simply
with an increased action of the regular process

of nutrition ; or, if you please, it may depend
on the nutrition of these follicles continuing to
be as active in the adult as it was in the child.
It is thus that the liver may continue as much
developed in the adult as it was in the early
period of its existence ; it is thus, too, that in
a man of middle age, although free from disease,
the different lymphatic ganglions may be found
as large as they are in children.

It follows from these considerations that the
intestinal follicles, as well those which are iso-
lated as those which, by their aggregation to-
wards the inferior portion of the ileum, form
the plexus of Peyer, may, in the adult, be some-
times apparent, and sometimes almost impercep-
tible, without either of these states being really
morbid ; so far as that each may occur without
producing any disorder of the digestive func-
tions.   We learn, besides, from comparative
anatomy, that a very great development of these
follicles is natural in some animals.   Thus, in
most of the dogs that are sacrificed to physiolo-
gical experiments, there are found in the small
intestine numerous extensive patches dotted
with black, exactly resembling those found also
in the human subject, but yet so far from con-
stantly, that when they are met with they are
considered as morbid.   They have been likewise
observed in the intestinal canal of numbers of

sheep killed in the slaughter-houses. I have also very often discovered them in horses ; but as I know not whether they had had any affection of the *primæ viæ* or not, I cannot, in their case, as in that of the other animals, bring forward the existence of these patches as a proof that they belonged to the healthy state.

The tissues subjacent to the mucous membrane present, in the healthy state, the following characters.

The submucous cellular tissue ought to have the appearance of a white layer, of a pretty great density, and traversed or not by a certain number of veins more or less gorged with blood. The muscular coat should be pale, resembling in colour the muscles of white blooded animals ; it should have its *maximum* of thickness in the pyloric portion of the stomach and in the rectum, and should appear thick in proportion to the contraction of the intestine. In persons who die in a state of marasmus, without any chronic irritation of the intestinal canal, the gastro-intestinal muscular coat becomes remarkably wasted. The cellular tissue interposed between this coat and the peritoneum is almost imperceptible in the healthy state : we must attend to this fact, because, in certain morbid states, this tissue may become hypertrophied, and contribute to the formation of various tumours.

Nothing is more variable than the capacity of the intestines in different bodies. But, we must take particular notice that we may find the intestinal tube exceedingly narrowed, on the one hand, without its presenting any appreciable lesion ; and exceedingly wide, on the other, although presenting indubitable traces of irritation. Sometimes it is found narrowed in a single spot, so as to form a kind of strangulation ; while, either above or below it, the intestine is very wide : there is, however, no more trace of irritation in the contracted part than elsewhere. I have frequently observed a great whiteness on the internal surface of stomachs that were so shrunk as hardly to surpass the bulk of the colon. I have found that other stomachs, which had been disorganized by the action of sulphuric acid, were very large.

The internal surface of the alimentary canal ought to be lubricated, in the healthy state, by a moderate quantity of a greyish viscous mucus, capable of being collected, in form of a pretty consistent pulp, on the blade of the scalpel by slightly scraping the membrane with it. In the stomach, this mucus, when not mixed with the *ingesta*, is in a state of purity; it accumulates and is ultimately digested when no aliment has been taken for a long time. The secretion of this mucus is promoted by introducing some

inert body into the stomach; such as a pebble, round which it collects, or a sponge, which may then be withdrawn impregnated with it. In the small intestine, it is mixed with a certain quantity of bile; in the great intestine its place is supplied by fæces, which are often found in great quantities in the colon of persons who yet have not eaten any thing for a long time.

CHAPTER II.

Of the Alimentary Canal considered in a State of Disease.

In the preceding chapter we have studied the different appearances the gastro-intestinal canal may present, and we have seen how much they may vary without there being a diseased state of the digestive passages. It is this diseased state which is now to engage our attention. In many instances we shall find that some of the alterations which belong to the morbid condition so exactly resemble some of the appearances of the healthy state as modified by one of the causes already enumerated, that it will be impossible for us to distinguish them. We must then be content to remain in doubt,

until new facts give us more light.   At other times, we shall meet with conditions of the alimentary canal which we shall not hesitate to recognize as the results of disease ; but frequently another question will then arise, as to the nature of these unequivocally morbid states. Do they result from irritation, or, in other words, from an increased organic action of the tissue in which they are situated ?   Or do they, on the contrary, depend on a diminution of this same organic action ?   Or do they arise from neither of these causes, but merely from a perversion of the nutrition ?   We shall sometimes be able to resolve these different questions ; but, sometimes also, for want of a sufficient number of facts to judge from, we shall leave them undecided.   For, nothing tends more to give a false direction to a science than presuming to anticipate facts, and attempting to solve a problem of which we do not yet know all the elements.

The different alterations that are about to engage our attention may exist either separately or together : most of them are alternately cause and effect of each other ; but, in order to study them, it is absolutely necessary to consider them separately.

Should we have designated by the common title of *acute* or *chronic gastro-enteritis* all the lesions which we are about to describe ?   In my

opinion that would have been prejudging the solution of more than one question that still remains undecided. I have considered it more advantageous to the science to avoid making use of this expression, which has lost its value from the single circumstance of its being too general. We shall, therefore, describe separately the different lesions which have latterly been comprehended under this generic term ; and we shall find that they are always lesions of circulation, nutrition, or secretion. In speaking of each, we shall endeavour to discover its nature, and to estimate the part, whether principal, secondary, or none at all, which irritation plays in its production ; and that, not only when we can use direct proof, but also when we can argue only from analogy or induction.

ARTICLE I.

LESIONS OF CIRCULATION.

§ 1. *Hyperæmia of the Alimentary Canal.*

In the preceding chapter we have seen how numerous are the varieties of vascular injection which the alimentary canal may present, with-

out our being warranted to consider it diseased; the injection taking place either during the last struggle or after death.   However, the red injection of the alimentary canal also may occur under the influence of a morbid state of any description whatever.   We must therefore endeavour to determine what varieties of injection may be produced in it by irritation or any other morbid condition, and to see how far they can be distinguished from those which may take place after death.

For this purpose, we must select cases in which a foreign body, applied during life to the gastro-intestinal mucous membrane, has modified its circulation, and, by drawing to it more blood than usual, has produced in it a morbid state.   Now the appearances that have been observed, with respect to colour, in the alimentary canal of men or animals, after the introduction of irritating poisons into their stomach, are a simple injection of vessels, which, according as they are more or less crowded, present either a very finely arborescent appearance, or a capilliform or ramiform network; in other cases, a uniform colour, either red, brown, or black; and, in others, effusions of blood on the free surface of the mucous membrane, or beneath it. Sometimes the villi do not participate in these various degrees of injection, and sometimes they do.

These different colourings are precisely similar to those we have seen produced independently of any morbid process. When, therefore, we meet with any such appearances, I grant we must allow they may, whatever be the shade, be the result of a morbid process ; but at the same time we must not forget that there is not one of them which may not also result purely from changes after death.

Hence follows this very important principle, namely, that the single fact of the red colour of the alimentary canal is not sufficient to prove the previous existence of disease in that part ; so that an intestine that is found red in the dead body, was not necessarily so during life.

Hyperæmia of the alimentary canal is generally confined to the mucous membrane. Nothing is more common than to find, underneath a portion of this membrane of an intense red colour, the subjacent cellular tissue perfectly white, and the other coats equally devoid of colour. Hence it follows that we cannot judge of the state of redness or paleness of the intestinal canal from examining it only externally : it frequently happens that, in such cases, its parietes appear pale, and the different tunics external to the mucous membrane are really so ; but the membrane itself may be of a more or less intense red, without its being perceived until the intestine be opened.

Independently of its forms and seat, whether in the vessels of different sizes that run between the coats of the alimentary canal, or in those various coats themselves, gastro-intestinal hyperæmia, considered only in the mucous membrane, may present three varieties, according as it affects principally the tissue of the membrane itself, its villi, or the follicles scattered through it.

The first variety presents nothing remarkable in its forms, which may be very different. The second is distinguished by its dotted form : on examining the internal surface of the canal where this variety exists, we find it overspread with a number of small red points, which are often so crowded as to render the mucous membrane perfectly opake. An attentive examination will convince us that each of these red points consists of the summit of one of the villi ; a fact which becomes particularly evident when the examination is made under water, as the innumerable filaments constituting the villi then become very apparent ; sometimes they are coloured only at their free extremity, and sometimes through their whole extent. In certain cases the injection is confined solely to the villi, and there is no trace of it in the membranous tissue from the surface of which they arise, and in which they are in a manner inserted.

Instead of a red colour, the villi of the gas-
tro-intestinal mucous membrane not unfre-
quently present a brown or even a deep black
tint. I have often found the internal surface of
the alimentary canal of a fine black colour, in
the bodies of individuals that have been labour-
ing under chronic diarrhœa; and in some cases
of this description I have satisfied myself that
this unusual tinge was situated in the villi of the
mucous membrane. I have also frequently
found the villi in the alimentary canal of the
horse, of a beautiful ebony black colour. This
black tint of the villi runs through a series of
shades into the red, which we may perceive be-
coming insensibly brown, and gradually arriving
at the deepest black. We have, elsewhere, seen
that there is often no other condition requisite
for this change of colour to take place, than a
simple diminution in the velocity of the capillary
circulation. I believe, further, that this black
tint of the villi, as well as the red, may be the
result of irritation of the digestive mucous mem-
brane, as is proved by the fact that in most of
the cases in which I observed such a tint, it was
in the bodies of persons who had been affected
with diarrhœa for a greater or less length of
time.

Hyperæmia from irritation does not occur
with equal frequency in all parts of the alimen-

tary canal.   Those in which it is most frequently
met with are the stomach and the lower portion
of the ileum.   After these come, successively,
the cæcum, the colon, the rectum, the duode-
num, the superior part of the ileum, and the
jejunum.

Hyperæmia without any other alteration be-
longs to the acute and the chronic state. In more
than one case in which the individual had for a
very long time been presenting signs of an intes-
tinal irritation, on opening the body after death
I have found only a simple congestion, without
any lesion in the texture of the membranes ; in
other cases, on the contrary, a few days are
sufficient for a slight hyperæmia to be succeeded
either by softening or ulceration.

It would be difficult to comprehend within a
few species the numerous varieties of form
which gastro-intestinal hyperæmia assumes.   I
think, however, I may point out the following
species, which I distinguish by the appearance
of the parts affected.

In the first species, the light can still be
seen through the membranes, between the ves-
sels, which are disposed in a form more or less
finely arborescent.

In the second, the light is totally intercepted,
and the opacity complete. In these two species
the redness that appears on the internal surface

of the intestine is disposed in dots, patches, spots, streaks, or bands. It is sometimes lost insensibly, and sometimes ceases abruptly.

Again, hyperæmia may be divided into three kinds, according as it is situated in the capillaries particularly, in both capillaries and larger vessels, or, lastly, in the larger vessels only.

Of these three kinds, the first belongs almost exclusively to a state of irritation, and is an almost certain proof of its existence. The second belongs equally to a state of irritation, and to a state of congestion from a mechanical cause that has acted during life or after death. The third kind but rarely depends on this last cause ; but yet neither does it announce a state of irritation similar to that which produces a hyperæmia of the capillaries solely. In fact, when the congestion is thus confined to some of the tolerably large vessels that are distributed in or under the gastro-intestinal mucous membrane, we have reason to think it belongs to a state of irritation that is on the decline ; and we may even admit that in such cases all irritative process has completely disappeared, and that the blood which is still found accumulated in some vessels appears there only because these vessels, having been distended by the unusual quantity of blood that traversed them as long as the irritation continued, remain passively dilated

after all irritation has disappeared. This is what often takes place in the mucous membrane of the eye, in which, long after the capillaries of the conjuctiva have ceased to admit blood, some large red vessels still continue to appear on that membrane. It then frequently happens, that it is by applying substances of a more or less stimulating nature to the conjunctiva that these vessels are forced to resume their natural dimensions, and to get rid of the blood which constantly tends to dilate them. May not this help to account for the success which sometimes attends a tonic mode of treatment when employed towards the end of certain kinds of irritation of the alimentary canal?

Hyperæmia of the follicles is not less remarkable in its form than that of the villi. On it, seem to me to depend those red circles which sometimes are found scattered over the stomach or intestines. These circles, which are apparently formed by very small vessels interlaced in various ways, circumscribe a slight elevation of the mucous membrane, which is owing to the presence of a follicle. It often happens, that, while the circumference of the follicle is thus defined by a vascular circle, another, smaller, but equally red, crowns, in a manner, the margin of its central orifice; this circle, like the preceding, consists of an assemblage of small ves-

sels most minutely injected. We may find in the same intestine a great number of follicles which are thus injected only at their circumference and centre, while they remain white in the rest of their extent. Frequently, too, both the red circle of the circumference, and that of the central orifice, become larger, approach each other as they increase in size, and at last meet ; which produces a uniformly red colour in several of the follicles. At other times, instead of these red circles, we observe some of a brown or black colour, which present in other respects the same arrangement. In certain cases, however, there is nothing to prove strictly that a follicle exists where the coloured circles in question make their appearance ; as there is no prominence to be observed within the circle, no depression towards the central red point. If in such cases we admit the existence of a follicular hyperæmia, it can be only by analogy.

The different shades of active hyperæmia of which we have now been speaking may be developed at all ages. They have been found even in the fœtus, and in newly born children. In such cases, however, we should take care not to confound hyperæmia from irritation, with simple mechanical congestion, which many causes may very easily produce in the infant at birth. In the latter case the stomach and in-

testines are found more or less injected; but the injection resembles that observed in persons with aneurism. The mesenteric veins, the liver, the lungs, and the heart, are gorged with blood. How short soever be the interval between death and the examination of the body, we find, both in the stomach and intestine, the blood extra-vasated, and effused sometimes beneath the mucous membrane, and sometimes into the interior of the canal. How important it is to be acquainted with these cases, in order to distinguish them from those in which the colouring of the alimentary canal of the fœtus, or of the new-born infant, depends on a real process of irritation!

The hyperæmia produced during life by a process of irritation proceeds, in its formation, in the reverse direction of the mechanical congestions. In the latter, the injection commences with the great veins, and spreads from these to the capillaries. In active congestion, on the contrary, it most frequently happens that we find only the capillaries injected, while the vessels of larger diameter are devoid of colour. Moreover, there are in active hyperæmia several degrees whose existence may serve to announce either its stage of increase or its stage of decline. In the first of these stages, it presents two degrees : the one, constituting the capilliform or

reticular injection ; the other, that in which the
vessels become so crowded, that every transpa-
rent interval disappears, and nothing is visible
but a uniform red tint. In the stage of decline,
we first remark, at the return from the second
towards the first degree of the increasing stage,
the arborescent or reticular injection.   What is
called the capilliform injection disappears, then
the vascular network becomes less and less dis-
tinct, and at last vanishes ; and where it existed
we observe only a few vessels of considerable di-
mensions, which may remain dilated and filled
with blood for a longer or shorter time after all
process of irritation has ceased.   It may hap-
pen, however, that, without any previous injec-
tion of the capillaries, one or more of the pretty
large vessels which run in the substance of the
gastro-intestinal parietes may become injected ;
and the ramiform injection is then a primitive
condition : the same thing is sometimes to be
observed in the conjunctiva.

It would be of importance to be able to dis-
tinguish the cases in which the colouring of the
alimentary canal depends, 1. on an irritation
originally chronic ; 2. on a chronic, which has
succeeded to an acute irritation ; 3. on an acute
irritation grafted on a chronic.   But it is not
yet possible rigorously to establish such dis-
tinctions ; all that can be said is, that the

brown, grey, and slate colour, specially belong
to chronic irritation. We must not, however,
forget, that the introduction into the stomachs
of animals, of irritating substances that speedily
destroyed life, has often produced in the mucous
membrane of the stomach a brown tint resem-
bling that generally connected with the existence
of chronic irritation. As to the red colour, it
belongs no less to chronic, than to acute irrita-
tion. I shall bring forward no other proof of
this than the case of a man, fifty-one years of age,
who died at *La Charité* after labouring under
diarrhœa for eight months. We observed him
wasting away without the abdomen ever feeling
painful, or fever lighting up for a single instant.
He had only four or five liquid stools, and often
less, in the four and twenty hours : he had the
greatest repugnance to all kinds of food. On
opening the body, the internal surface of the
stomach was found to be of a brown colour,
which was situated in the thickened mucous
membrane. The mucous membrane of the
small intestine was of a deep red, in about the
upper four-fifths of its extent : the lower fifth
presented merely a slight appearance of injec-
tion. The internal surface of the cæcum was
white. The mucous membrane of the colon and
of the beginning of the rectum was spotted with
a multitude of red patches, of an oval or round-

ish form, which completely intercepted the light. Thus, all that was found in the body of a man who had died in the last degree of marasmus and exhaustion, was a little more blood in the gastro-intestinal mucous membrane than usual, tinging that membrane brown in the stomach, and red in the rest of the alimentary canal.

§ II. *Anæmia of the Alimentary Canal.*

This lesion, upon which the attention of observers has hitherto been but little fixed, is not very rare. Its anatomical character is an extreme paleness of the alimentary canal, either throughout its whole extent, or in some parts only. It is usually accompanied by a more or less considerable attenuation of the gastric or intestinal parietes. We seldom observe it but in the bodies of persons who have died exhausted by various chronic diseases, or who sink while convalescent from a severe fever. In this last case, it sometimes happens that at the same time that we find the alimentary canal completely devoid of blood, we discover in it ulcers which are as pale as the surrounding tissue. I have also met with this coexistence of anæmia and ulceration in several young children, who, after having suffered under diarrhœa, had gradually wasted away and died comatose.

ARTICLE II.

LESIONS OF NUTRITION.

§ I. *Hypertrophy of the Alimentary Canal.*

THIS hypertrophy may exist simultaneously in the different coats of the stomach, or be confined to some of them, or even may involve but one of the anatomical elements of the mucous membrane, such as the follicles. In these different cases, the gastro-intestinal parietes assume very varied aspects, so different, indeed, that they have often been considered varieties of diseases. Frequently, also, the real nature of the alterations produced by hypertrophy of one or more of the coats of the stomach or intestines has been mistaken; for instance, some have considered as new tissues, developed in the substance of the gastro-intestinal parietes, these parietes themselves, though having undergone no change but simple hypertrophy in some of their coats. Thus, the name of *cancer* has been given to a mere thickening of the submucous cellular tissue, &c.; as well might the name have been given to the thickening of the cellular tissue which surrounds old cutaneous ulcers, or to the induration which affects the interlobular cellular tissue in certain diseases of the lungs.

We shall now follow this hypertrophy succes-
sively through the different coats of which the ag-
gregate constitutes the gastro-intestinal parietes.

A. *Hypertrophy of the Mucous Membrane.*

Real hypertrophy of the mucous membrane
must be distinguished from the thickening it
may present in the case of simple hyperæmia,
in which more blood than usual stagnates in the
mucous membrane, which becomes tumefied, but
its nutrition has not been really increased.

When the gastro-intestinal mucous mem-
brane is really in a state of hypertrophy, it is at
the same time harder and more resisting than
in the natural condition : it may be removed in
large shreds without tearing, and the cellular
tissue which separates it from the muscular coat
remains uninjured beneath.

Hypertrophy of the mucous membrane both
of the stomach and intestines may be accompa-
nied by different shades of colouring which it is
important to notice. Thus, it may exist, 1. with
retention of the usual colour of the membrane,
which is a rare case ; 2. with different degrees
of redness ; 3. with a slate-coloured tint ; and,
4. with a brown or even black tint.

Hypertrophy of the mucous membrane is
more common in the stomach and great intes-

tine than in the small intestine, and may be
either general or circumscribed in these diffe-
rent parts.   Thus, for example, it is not uncom-
mon to find the mucous membrane of the sto-
mach in a state of hypertrophy through its whole
extent : the membrane, while becoming thicker,
sometimes preserves a smooth and uniform ap-
pearance ;   sometimes, being increased une-
qually, it presents a number of elevations sepa-
rated by sinuous depressions ; it then assumes
a papillary appearance.   In the large intestine,
the general hypertrophy of the mucous mem-
brane is sometimes so great, that it alone exceeds
in thickness all the other coats taken together.

When hypertrophy of the mucous mem-
brane occupies only isolated points, that is, in
other words, when it is partial or circumscribed,
it produces on the internal surface of the sto-
mach or intestines, elevations, projections,
patches, and tumours, of various forms, sizes,
and textures.

It is not very uncommon to find, on the in-
ternal surface of the stomach, irregular patches,
rising only from half a line to two lines above
the level of the rest of the membrane, and some-
times of the same colour with it, sometimes red,
brown, or grey, and lastly sometimes of a deader
white than the rest of the membrane.   I have
twice found some of these patches of a milk-

white tint. They may be round, somewhat oval, or elongated. If we cut into them, and examine their structure, we become satisfied that they consist solely of the mucous membrane, which is merely in a state of hypertrophy in these particular spots. These patches differ in their nature from other patches which it is not unusual to meet with towards the termination of the small intestine, and which are owing to a morbid condition of the follicles. Instead of simple patches, the mucous membrane may become affected with hypertrophy in such a manner that there shall appear on its surface different productions which have been designated by the names of excrescences, vegetations, fungi, polypi, and cancers; and which are nothing but various forms of hypertrophy of the mucous membrane, as any one may satisfy himself by an attentive dissection. The word *excrescence* indicates well enough the result of this kind of process, in which we observe on the surface of the mucous membrane a real growth of its different anatomical elements.

The varieties of appearance of these partial hypertrophies depend on the differences they may present in form or texture.

The varieties of texture shall now engage our particular attention. The mucous membrane, while shooting up above its surface, or

vegetating, may either preserve its usual consistence, become much harder, or, lastly, present several degrees of softening : it may be pale, or display all possible shades of colour ; it may receive but little blood, or be traversed by numbers of vessels, and by veins which, from their gorged and dilated state, sometimes resemble varices, or, from their interlacement and the facility with which the blood escapes from their interior, represent a sort of erectile tissue. According to these different textures, different names have been given to the circumscribed hypertrophies of the gastro-intestinal mucous membrane ; they have been denominated vegetations, fungi, polypi, scirrhi, &c.

Many of these names have also been employed to designate varieties of form of these productions. Some, for instance, are of equal size throughout, being sometimes globular, sometimes cylindrical, and sometimes not resembling any geometrical figure. I once saw a stomach of which the internal surface was furnished with numbers of laminæ placed side by side edgewise, and at right angles to the longitudinal axis of the stomach, which were formed solely by an unusual development of the mucous membrane. They rose fully from two to five lines above the level of the membrane ; and might be exactly enough compared to the laminæ which, in ru-

minating animals, characterize that portion of
the stomach which has received the name of
maniplies.   Other excrescences are not of equal
size through their whole extent.   Considered at
their adherent extremity, they are to be distin-
guished into those which have a base of greater
or less extent where they are continuous with
the mucous membrane, and those which are
connected by a more slender portion, called a
pedicle, which may contain only some capilla-
ries, or afford a passage to vessels of considera-
ble size.   With regard to their other extremity,
these excrescences present still more varieties of
form.   Some terminate in a point ; others are
rounded at their free extremity ; while others
swell out considerably, and form a kind of head
resembling that of a mushroom or of a cauli-
flower.

These excrescences, in all the varieties just
described, have been observed in every part of
the alimentary canal from the cardiac orifice to
the anus.   In the stomach, they are to be dis-
tinguished into those which occupy, 1. one of
the surfaces of the organ ; 2. its cardiac orifice;
and, 3. its pyloric orifice.   They are much more
uncommon in the duodenum and small intestine
than in the stomach ; however M. Billard once
found in a new-born infant, near the middle of
the second curvature of the duodenum, a pe-

dunculated excrescence, which was red and irregularly shaped like a strawberry. It was of the size of an ordinary kidneybean, and was firmly attached by its stalk to the surface of the mucous membrane. It was remarkable for the great quantity of blood it contained. The excrescences become more frequent, but yet less so than in the stomach, towards the cæcum, colon, and commencement of the rectum; finally, in the inferior part of this last intestine they are to be met with more frequently than any where else; and it is deserving of remark that, towards the anal orifice, they are often produced by a special cause, namely, the syphilitic virus.

With respect to their number, they are sometimes solitary, there being but one to be found in the whole extent of the intestinal tube; and sometimes many, whether in the same portion, or in different parts, of the intestines. Thus, I found once on the internal surface of a stomach seven vegetations, each of about the size of a walnut, which all resembled each other in texture and form, and adhered by a pretty broad base to the mucous membrane, of which they were merely a development. They were traversed by numbers of vessels, and terminated in a broad head with an unequal surface of a kind of papillary appearance, with the margin

very much turned down. Six of these excrescences occupied the middle of the stomach; the seventh was situated near the pylorus. The mucous membrane of the intervening spaces was not altered in any appreciable manner. M. Rullier presented to the *Académie Royale de Médecine* a stomach whose surface was studded with about eighty small round tumours, each of the bulk of a filbert, of firm tissue, and evidently formed at the expense of the mucous membrane, of which they were merely small portions in a state of hypertrophy and induration. I once found the cæcum studded with a score of small conical bodies, of a violet red colour, each of which were nearly as large as a small bean. On dissection I found that their tissue was exactly similar to that of the mucous membrane, of which they were evidently prolongations. Lastly, it is not very unusual to meet with such developments of the mucous membrane at the same time in the stomach and in some part of the intestine, especially towards its ileo-cæcal portion. I might here bring forward the case of a man who died at *La Charité*, whose body I did not see till after death. From the internal surface of the stomach, near the pylorus, there sprung a large vegetation, resembling a mushroom; near the point of junction of the jejunum and ileum was another of the same kind;

and, lastly, a little above the cæcum was a third excrescence, which resembled the other two both in form and texture.

In place of involving the whole of the proper texture of the gastro-intestinal mucous membrane, it may happen that the hypertrophy shall occur only in a greater or less number of the villi which cover its free surface. Several of these villi, of a much greater size than ordinary, have been sometimes observed projecting considerably above the mucous membrane, from which they differed by their colour being of a deader white, and by forming small tumours, the nature of which was easily to be discovered by an attentive examination. It is possible that many vegetations of the gastro-intestinal mucous membrane may be owing to a hypertrophy of some of the villi.

The villi, however, have been less frequently discovered in a state of hypertrophy than the follicles. The unusual development of these small bodies often gives rise to the formation of tumours which, in form, arrangement, and structure, seem so different from the follicles, that their origin might easily be mistaken. One is not disposed to refer them to a simple hypertrophy of the follicles, until he has followed these in the series of transformations they undergo in proportion to the increase and develop-

ment of the different anatomical elements that enter into their composition.

We have already seen that, in the alimentary canal of children, the follicles are naturally more apparent than in the adult. Hence it follows that, in adults, whenever the internal surface of this canal is found studded with very apparent follicles, we are to consider their development as a morbid state.

The follicles of the intestinal tube may be much more apparent than ordinary, and project above the free surface of the mucous membrane, without being in a true state of hypertrophy. This is what happens in those cases where, in consequence of an acute or chronic inflammation of the canal, the follicles spread over it become the seat of a more or less considerable active hyperæmia. Being then gorged with blood, they become tumid, and form on the internal surface of the intestine a greater or less number of small conical elevations, which frequently exhibit a central orifice that has been often taken for an ulcer. These are isolated where the follicles are so; and are confluent, and form by their assemblage large patches elevated above the level of the mucous membrane, where the follicles are aggregated; constituting the *dothinenteritis* of M. Bretonneau.

From the single circumstance of the follicles

of the alimentary canal having been affected by a hyperæmia of variable intensity and duration, their nutrition acquires a greater activity. After the cessation of the hyperæmia, they still continue to increase in bulk, or else retain the bulk they had acquired while congested, and they are then really in a state of hypertrophy. In this case, the hypertrophy succeeds an evident hyperæmia. I have observed this remarkable development of the follicles in bodies of persons who had all the signs of gastro-intestinal irritation at a more or less remote period before their death. The internal surface of the mucous membrane was studded with small, conical, whitish bodies, tolerably hard, and most of them with an evident central orifice : the mucous membrane between them did not exhibit any appreciable alteration. In some of these individuals, there had not been any derangement of the digestive functions for a long time ; so that the hypertrophy of the intestinal follicles had not produced any functional disorder in them : others had been frequently affected with diarrhœa, which used to cease at intervals, and return again with the greatest facility : in others, lastly, the diarrhœa had been constant ; and yet in these there was nothing found but an unusal development of the follicles, just as in the first mentioned ; but then the follicles had at the same time acquired

a greater activity of secretion, which was the cause of the diarrhœa whether intermittent or constant.

In the cases we have now examined, the hypertrophy of the follicles has been preceded by a state of acute hyperæmia ; but that affection may also take place insensibly, without any signs of antecedent hyperæmia, just as we often see certain cutaneous follicles becoming larger, without their ever having been the seat of any appreciable sanguineous congestion.   In this case, as in the preceding, sometimes there has never been any diarrhœa, while at other times it has appeared, either at intervals, or constantly.   Hypertrophy of a great number of follicles may be the only alteration found in the alimentary canal of persons that have been continually affected with diarrhœa for the last six months or the last year of their life.

The orifice of the enlarged follicles often retains its natural size ; in other cases it grows wider ; and lastly, in others, it grows narrower, tends to become obliterated, and even actually does become so.   The enlargement of the orifice is sometimes so considerable that the mouth of the follicle becomes as wide as the bottom ; in which case the follicle might easily be mistaken for an ulcer.   In other cases, as I have already remarked, while the parietes of the follicle become en-

larged and thickened, its orifice diminishes and becomes effaced. The result is, that the fluid secreted in its interior constantly accumulates, and voluminous tumours are thus gradually formed : such are often found in the intestines of horses. I have seen some in the stomach of these animals that were as large as an orange. Their real nature might easily be mistaken, were it not that, in most cases, the orifice of the folicle may be discovered on attentive examination, and a probe introduced, so as afterwards mechanically to enlarge it. It is true that, in some cases, the orifice cannot be found, being, as it would appear, completely obliterated.

At the same time that the portion of mucous membrane that constitutes the parietes of a muciparous follicle becomes affected with hypertrophy, that kind of cellulo-fibrous tissue which lines them, as it does the rest of the mucous membrane, not only becomes similarly affected, and indurated, but is also often transformed into fibrous, fibro-cartilaginous, or cartilaginous tissue, which surrounds the follicles on all sides, and considerably augments the thickness of its parietes. These tumours occur much less frequently in man than in the horse : M. Dupuy has found similar ones in dogs, sheep, and pigs.

Hypertrophy of the follicles does not occur with equal frequency in every part of the ali-

mentary canal. Thus, it is found oftener in the inferior part of the small intestine than any where else. In the stomach, it is very uncommon. M. Billard, however, saw, in a child ten months old, the mucous membrane of the stomach studded throughout its whole extent with a prodigious number of white granules, of about the size of a grain of millet. There were similar ones in the whole course of the intestines. Were these follicles?

We must take care not to confound with follicles in a state of hypertrophy certain small whitish bodies which are sometimes found scattered on the internal surface of the intestines, and which at first sight greatly resemble such follicles. These are nothing but rudiments of *valvulæ conniventes*, on or between which they are situated. Some tufts of the villi, of a deader white than those around them, might also be sometimes mistaken for follicles.

B. *Hypertrophy of the Tissues subjacent to the Mucous Membrane.*

This kind of hypertrophy may affect, 1. the cellular tissue interposed between the different coats of the gastro-intestinal parietes; and, 2. the muscular coat.

Writers have long described under the name

of *scirrhus of the stomach* or *intestines* a certain
state of those parts consisting merely of an in-
crease of thickness and density in the cellular
membrane which, in the natural condition, sepa-
rates the mucous membrane from the muscular
tunic.   Any one may convince himself of this
by following the hypertrophy of this kind of cel-
lular tissue through all its stages.   In the first
place, in many cases of chronic diarrhœa,
where the mucous membrane of the great in-
testine has undergone various kinds of altera-
tions, the cellular tissue which lines it is often
found much more apparent than usual ; in such
cases, it is sometimes several lines in thickness,
so as of itself to surpass that of all the other
coats taken together : it is hard, of a pearly
white, and without any blood vessels ; some-
times there may be observed in it fibres or
plates more or less regularly arranged ; and
sometimes it exhibits nothing but a homogeneous
texture, pretty like that of imperfect cartilage.
As long as this cellular layer is of little thickness,
it is considered only as indurated cellular tissue,
similar to that which surrounds old cutaneous
ulcers, or appears between the pulmonary lo-
bules in certain cases of chronic affections of the
respiratory organs.   There is often interposed
between the mucous and muscular coats, from
the commencement of the colon to the rectum,

a white layer of from half a line to two lines in thickness. This, again, is considered merely as an induration of the submucous cellular tissue.

But, when the hypertrophy is more considerable, and at the same time more circumscribed; when, in short, it forms in some one point of the intestinal tube a real tumour which raises up the mucous membrane, it is then no longer denominated induration, nor hypertrophy, but scirrhus. In this case, however, the alteration is the same as in the preceding ones; the cellular tunic has become ten times as thick as natural in a circumscribed point, instead of becoming twice as thick throughout a great extent: there lies the whole difference. The same disposition, texture, and anatomical elements, are to be found in the whitish layer that lines the mucous membrane of the great intestine, as in the bulky tumour that obstructs the cardia or the pylorus. Writers, then, may, if they please, give the name of scirrhus to such a tumour, provided that they come to an understanding as to the meaning of the word, and acknowledge that in this case the scirrhus is not a new tissue, without any thing analogous in the healthy state, and created, like an entozoon, in the parietes of the stomach or intestines; but that it is simply the result of a hypertrophy of the submucous cellular tissue,

which may either continue to be the sole
lesion, or may subsequently become complicated
with other alterations of nutrition or secretion.
In fact, a new structure often does develop itself
in the cellular tissue thus affected with hyper-
trophy; numerous vessels make their appear-
ance in it; it becomes divided into lobes, or
hollowed into cells or areolæ; and, lastly, va-
rious morbid secretions take place.

On examining the parietes of the stomach or
intestine where the submucous cellular tissue is
affected with hypertrophy, we often find that the
affection is not confined to that tissue only ; but,
in the substance of the muscular tunic there ap-
pear white lines, or true partitions of a cellulo-
fibrous appearance, which are interposed from
space to space between the lacerti of the mus-
cles, thus isolating them from each other, and
giving the tunic a kind of lobulated appearance.
These partitions are continuous, on the one
hand, with the submucous cellular tissue, and
on the other, with another cellular layer, inter-
posed between the muscular tunic and the peri-
toneum : they are evidently nothing but portions
of the intermuscular cellular tissue in a state of
hypertrophy. But, the hypertrophy may be-
come more considerable ; and in place of sim-
ple lines or thin plates, it may happen that we
shall find scattered through the substance of the

muscular coat certain hard white masses of more or less considerable size, which are still nothing but the same cellular tissue in a state of hypertrophy; these also increase, and eventually take up more room than the muscular coat itself, which becomes less and less apparent, until a period arrives when, at most, a few muscular fibres can be discovered scattered at wide intervals through enormous masses of indurated cellular tissue, in the substance of which they are in a manner imbedded; at last all appearance of muscle is lost, and there is nothing to be found between the peritoneum and the mucous membrane but a mass of cellular tissue, either simply in a state of hypertrophy and induration, or having become the seat of various alterations consecutively.

Hypertrophy of the submucous cellular tissue is, in general, only developed subsequently to a state of chronic irritation of the mucous membrane, although none of the numerous varieties of such irritation necessarily determine its formation. It may, however, happen that there is no appreciable lesion to be discovered in the mucous membrane, either because such lesion has long ceased to exist, or even, in some cases, because it never did exist. In other cases, the mucous membrane is found in a state of hyperæmia, induration, or softening; and, last-

ly, in others, in a state of ulceration. There are even cases in which there is not the least trace of this membrane to be met with in the whole part corresponding to the hypertrophied portion of the cellular tissue.

Hypertrophy of the submucous cellular tissue has been observed in every part of that portion of the alimentary canal that is beneath the diaphragm. We shall first turn our attention to it as it exists in the stomach.

There are some cases in which the submucous cellular tissue is considerably thickened throughout the whole extent of this organ. In such cases, on touching the parietes of the stomach, one is struck with their hardness. They do not yield, as in the natural state ; and they offer a sufficient resistance to the knife to grate under it. Outside the thickened cellular layer, the muscular tunic is sometimes found in its natural condition, and sometimes divided into lobules by fibro-cellular intersections ; in a state of hypertrophy, or, on the contrary, in such a state of atrophy, that there is not a trace of it left, so that there is nothing to be found between the mucous coat and the peritoneum but a mass of indurated cellular tissue. The cavity of the stomach is then usually but of small dimensions.

There are, again, other cases in which the hypertrophy of the submucous cellular tissue

takes place only in a circumscribed part of the stomach, which is sometimes one or other of its faces, and sometimes one of its orifices. Of the various parts of the stomach, that of which the cellular tissue is most frequently affected, is incontestably its pyloric extremity, as well as the pylorus itself. Any one that has been at all conversant with anatomical researches must have met with some of those cases in which, for an extent of two or three finger's breadths on the gastric side of the pylorus, there is a tumour, which is sometimes perceptible only in the interior of the stomach, and sometimes projects exteriorly, so as to be discoverable through the abdominal parietes : this tumour proceeds from hypertrophy of the cellular tissue. Various other lesions may coexist with this, and modify the nature of the tumour, but they do not affect its form or bulk. As we approach the splenic portion of the stomach, we find the cellular tissue gradually diminishing in thickness, and resuming its natural appearance. Sometimes the hypertrophy is strictly confined to the pyloric ring, and on each side of it there is nothing morbid to be seen in the submucous cellular tissue. In these various cases, the duodenal orifice of the stomach may exhibit three different conditions : 1. it may have preserved its usual diameter ; 2. it may be narrowed ; 3. and lastly, it may be dilated.

When the first of these conditions exists, the stomach does not change either in form or in bulk; the ingesta do not accumulate in it, and vomiting may not occur, though the pylorus or neighbouring parts may be the seat of a tumour discoverable during life through the abdominal parietes.

When the second condition occurs, a very remarkable phenomenon is observed : the solid or fluid substances introduced into the stomach not being able to pass the pylorus without the greatest difficulty, accumulate in that viscus, which, being thus continually distended, at last acquires an enormous bulk. I have elsewhere (*Clinique medicale*) detailed cases of this description : in one, the stomach became so large as to cover the whole of the intestines, and to reach the os pubis with its great curvature. Such a great increase of bulk is rather uncommon ; but stomachs are pretty often found which reach as low as the navel in consequence of the contraction of the duodenal orifice. On such occasions, the parietes of the stomach are sometimes considerably attenuated, and sometimes of their usual thickness, in which case we must admit that they are even in a state of hypertrophy, since their surface is much greater without their thickness being diminished.

When the stomach is thus distended, it may

retain the substances introduced into it for seve-
ral days : they fill it as they would an inert bag ;
and on giving the body of the patient a brisk
shake, a very distinct rumbling is produced.
At last a period arrives when the stomach, being
distended beyond measure, empties itself by dis-
gorging its contents ; and hence arise those vo-
mitings, so remarkable for their extreme copious-
ness, which supervene from time to time, every
eight or ten days, for instance, in persons affect-
ed with the disease at present under considera-
tion.

Lastly, when the third condition exists, that,
namely, in which there is at the same time hy-
pertrophy of the submucous cellular tissue of
the pyloric portion of the stomach, and preter-
natural enlargement of the duodenal orifice, the
rest of the stomach may retain its natural bulk ;
but, the contrary may also take place, and, in
more than one instance, a dilated state of the
pylorus has been observed to coexist with a
considerable augmentation of the capacity of
the stomach, equal to what it is capable of ac-
quiring in the case of the tendency to the obli-
teration of the duodenal orifice. That orifice
then dilates along with the rest of the stomach,
at the same time that its parietes are affected
with hypertrophy, just as a considerable en-
largement of the cavity of the heart or of the

aorta is in general accompanied by an increase
of thickness of their parietes.

I do not know an instance where the hyper-
trophy has been found to be confined to the
submucous cellular tissue of the great extremity
of the stomach exclusively; but it has been found
involving the circumference of the cardiac ori-
fice, without affecting the rest of the viscus.
How inconsiderable soever this may be, it has
the effect of narrowing the orifice ; which pre-
vents the substances swallowed from arriving
freely into the cavity of the stomach. The
affection may be confined solely to the circum-
ference of the cardia, or extend to the inferior
part of the œsophagus.

Hypertrophy of the submucous cellular tissue
of the small intestine is much less frequent than
hypertrophy of the submucous cellular tissue of
the stomach. When it is found there, it gene-
rally occupies but a small extent, where it forms
a tumour which is sometimes confined to one of
the sides of the intestine, and sometimes en-
gages its whole circumference. In both these
cases, especially in the second, the cavity of the
intestine is more or less considerably contracted,
and its contents pass on with difficulty. In such
cases, although the lesion is constant, a remark-
able intermission is often observed in the symp-
toms that announce the existence of an obstacle

to the course of the fæcal matter. After several
months of obstinate constipation, during which
all the symptoms of internal strangulation with
severe pain in some spot of the abdomen have
frequently appeared, it sometimes happens that
all these symptoms disappear, and the dejec-
tions become free again. The same symptoms,
however, return anew, and each time with in-
creased severity; and the patient often dies
during such a relapse. These singular inter-
missions can be explained only by supposing
that the tumour formed by the hypertrophy of
the cellular tissue merely diminishes the calibre
of the intestine, without obliterating its cavity
entirely; and that such obliteration results from
the momentary tumefaction of the portion of
mucous membrane which lines the affected cel-
lular tissue.

The submucous cellular tissue of the great
intestine is more frequently affected with hyper-
trophy than that of the small intestine; and, as
in the case of the stomach, the affection may be
general, or confined to some one spot. The
same effects are produced as in the small intes-
tine. Obstruction to the course of the fæcal
matter arising from circumscribed hypertrophy
of the submucous cellular tissue has been more
frequently observed in the ascending and de-
scending portions of the colon than in the trans-

verse ; and it is observed still more so in the lower part of the rectum. This last is even, next to the stomach, the place where the species of lesion under consideration most frequently occurs : the result is one of the varieties of that complicated alteration that has been designated by the name of *cancer of the rectum.*

In certain cases, hypertrophy of the submucous cellular tissue exists to a high degree about the anus, producing without and around that orifice a greater or less tumefaction, that projects like a cluster of hæmorrhoids, which it greatly resembles. In place of a circular tumefaction, there sometimes exist around the anus some isolated tumours which also resemble hæmorrhoids. On dissecting each kind, they are found to be composed, proceeding from without inwards, 1. of the mucous membrane, more or less injected ; and, 2. of the submucous cellular tissue, considerably thickened, and forming the tumour. At a later period, this cellular tissue may become constantly more indurated, or may soften, suppurate, ulcerate, &c., as also may the mucous membrane itself ; whence result various kinds of alterations designated by the generic term cancer. A short time ago, on opening the body of a person whose anus was thus surrounded by tumours of an hæmorrhoidal appearance, which were composed of nothing but masses of

cellular tissue in a state of hypertrophy, I found the whole internal surface of the rectum studded with tumours of a similar description. Their appearance reminded me of those great tubercles of the skin which characterize one of the varieties of elephantiasis. They formed, on the free surface of the intestine, globular bodies of a livid red. Like the tumours of the anus, they were composed of the submucous cellular tissue considerably thickened; beneath this the muscular coat was found untouched; and above it was the mucous membrane, which was red, and somewhat tumid. Some vessels of a pretty considerable size rose perpendicularly from the muscular coat, traversed the cellular mass, and distributed themselves over the mucous membrane.

Hypertrophy of the submucous cellular tissue does not appear with equal frequency at all ages. It is very rare in infancy; however, in a child about a year old, I found on one spot in the small intestine a tumour as large as a filbert, which was composed of this tissue in a state of hypertrophy: the mucous membrane covering it was unaltered.

M. Billard found a considerable thickening of the submucous cellular tissue in a child six days old, which had come into the world in a very advanced state of marasmus, and was

affected with a copious diarrhœa and a slight jaundice. The parietes of the end of the ileum and of the colon were very much thickened, which was entirely owing to hypertrophy of the submucous cellular tissue, which had at the same time a whitish and pearly appearance. The mucous membrane was also somewhat thick, very red, and remarkably friable.

I have also several times discovered hypertrophy of this tissue through the whole of the great intestine in children of from four to twelve years of age, that had been affected with chronic diarrhœa. From the period of puberty until towards the thirty-fifth year, this affection is very rare. I once, however, found, at *La Charité*, in a young man twenty-two years of age, a voluminous tumour which occupied the pyloric portion of the stomach, and which consisted of a mass of cellular tissue in a state of hypertrophy. The patient had had, for the three preceding years, all the symptoms of an organic affection of the stomach. At nineteen his digestion began to be deranged ; he was tormented with acid risings in his mouth, and had a feeling of weight about the region of the stomach, immediately after taking food. He fell away daily, but did not vomit. At twenty-one he began to experience frequent nausea, and from time to time threw up his food and drink. These vo-

mitings became more and more frequent; and when he entered *La Charité*, which was only a few months before his death, he vomited almost every day, and a tumour could be distinctly felt in the epigastrium, to the right of the ensiform cartilage.

After the age of thirty-five years it becomes much more usual to find chronic irritation of the mucous membrane of the alimentary canal, the stomach especially, succeeded by hypertrophy of the submucous cellular tissue. After sixty-five this affection again begins to appear more rarely; and in old people who die after having long suffered from painful digestion, it is much less frequently found than softening of the mucous membrane and the subjacent tissues. Thus it may be established as a general principle, that it is between thirty-five and sixty-five that the lesion under consideration most frequently occurs. Cases of it have, however, been observed up to a very advanced age; and I might here relate one of an old man of seventy-nine, who died at *La Charité*, in whom was found, in the whole pyloric portion of the stomach, a hypertrophy of the submucous cellular tissue, considerable enough to produce a tumour projecting into the cavity of the organ. The mucous membrane above it was free from all appreciable alteration.

At the same time that the cellular tissue exhibits the state of hypertrophy we have just been studying, the muscular coat, as we have said, often becomes less apparent, and there are even instances where there are no traces of it to be found.   But exactly the reverse case may occur, and the increase of thickness of the cellular layers of the stomach is sometimes accompanied by a considerable state of hypertrophy of the muscular coat.   In such cases, on making a clean incision through the thickened parietes of the stomach, we find, proceeding from within outwards, 1. the mucous membrane, sometimes sound, and sometimes altered in various ways ; 2. immediately beneath this, a layer of a milky white, varying in thickness from less than a line to several inches ; this is the submucous cellular tissue ; 3. beneath this layer appears another, distinguished by its bluish colour, semitransparent, and with a peculiar kind of lustre ; it is traversed by lines exactly similar in colour and appearance to the preceding layer ; this is evidently the muscular coat in a state of hypertrophy ; 4. and lastly, still more externally there may appear a second layer of a dead white colour, and homogeneous texture, resembling the layer situated immediately beneath the mucous membrane ; this is, in fact, the subperitoneal cellular tissue, which has become thickened and

indurated like the submucous.   Thus, in this instance, hypertrophy of the muscular coat accompanies the thickening of the cellular layers which enter into the composition of the gastro-intestinal parietes.   But, in others, the cellular tissue remains untouched, and the muscular coat alone is affected ; and may be so much so as to produce a considerable thickening of the parietes of the stomach or intestines.   It is in the pyloric portion of the stomach especially that this kind of hypertrophy has been observed; and that is also one of the parts where, in the natural condition, the muscular coat of the alimentary canal is of the greatest thickness, and its action most remarkable.   In fact, on opening the abdomen of a living animal, we find that the right quarter of the stomach, the pylorus, and the commencement of the duodenum, are continually animated with a contractile motion which is propagated from the stomach towards the duodenum, and from that back again.   This motion is most distinct during the process of chymification ; whence it follows that whatever tends to excite the mucous membrane must tend to increase the action of the muscular fibres of the pyloric portion, and must consequently also have a tendency to produce in them a state of hypertrophy.   Dr. René Prus*

* Recherches sur la Nature et le Traitement du Cancer de l'Estomac ; par René Prus, 1828.

observes that the frequent vomitings that occur in some patients labouring under a chronic irritation of the gastric mucous membrane may greatly contribute to the production of the hypertrophy of the muscular coat of the stomach.

The lesions we have just pointed out are those which have long been, and are still every day, described under the name of *scirrhus of the stomach*. We can now see in what this scirrhus consists, which is, in a great many cases, merely a hypertrophy of one or more of the submucous layers of the stomach, producing a constant modification in their consistence and colour, and, moreover, frequently accompanied by various alterations of secretion to be pointed out farther on.

We have now examined the part that each of the tunics of the alimentary canal bears in the hypertrophy of its parietes ; but we have not yet arrived at the last term of the analysis, if I may use the expression ; we have still to inquire if this affection may not also attack, more or less separately, 1. the blood vessels that run in the substance of the parietes of the alimentary canal ; 2. its lymphatic apparatus ; and, 3. its nerves.

There is nothing more common than to find some vessels both in the stomach and intestines, in a state of dilatation ; but this is not hypertrophy.

Sometimes, however, their parietes are in a most evident state of hypertrophy ; thus, in two cases of chronic affections of the stomach, I discovered a considerable thickening in the parietes of two veins which ran, gorged with blood, beneath the mucous membrane.

As to the hypertrophy of that portion of the lymphatic system which carries the chyle or the lymph from the alimentary canal, pathologists have long been acquainted with it. In fact, what else but hypertrophy is that evident increase of volume, together with redness or paleness of their tissue, exhibited by the mesenteric ganglions in most cases where the intestinal mucous membrane has been the seat of irritation more or less prolonged ? Undoubtedly, at the commencement of such irritation, the tumefaction of the mesenteric ganglions depends simply on sanguineous congestion, and hypertrophy has not yet taken place ; but it occurs subsequently, whether the irritation continues or ceases. Indeed, this affection of the ganglions often remains as a trace and indication of the intestinal irritation which produced it, and which has long completely disappeared. In some cases, these ganglions, at the same time that they are in a state of hypertrophy, are also affected with hyperæmia ; in others, on the contrary, they are pale and even more colourless than in their na-

tural condition; so that the only unusual ap-
pearance they present is an increase of size.

The ganglions which receive the lymphatic
vessels of the stomach are much less frequently
affected with hypertrophy than those of the me-
sentery ; some of them, however, are occasion-
ally found large enough, along the great or
small curvature of the stomach, or around the
pylorus.

I have often carefully examined the nerves
of animal or organic life that are distributed over
the gastro-intestinal parietes ; and have never
been able to discover the least alteration in them.
However M. René Prus* has had an opportunity
of observing a case in which one of the branches
of the pneumogastric was evidently affected with
hypertrophy, near its termination on the sto-
mach.   The subject was a man of fifty-two years
of age, who fell a victim to a tedious disease of
the stomach, during which he exhibited all the
symptoms of a so called *cancerous* affection of
that viscus.   The mucous membrane was found
but little altered ; the submucous cellular tissue
was of a dead white, of the consistence of lard,
and considerably thickened ; and the muscular
coat was very much affected with hypertrophy.
These different alterations existed in the body

* *Op. cit.* pag. 86.

of the stomach, for an extent of about three inches transversely ; the pylorus and cardia remained free. A tumour, which had been discovered during life, was the result. In this terminated the right œsophagean branch of the pneumogastric, which, from the cardia to the superior part of the tumour, *had increased to twice its bulk,* without change of colour or consistence ; it then entered the tumour, where it was no longer possible to follow it.

§ II. *Atrophy of the Alimentary Canal.*

This may take place either in the whole of the layers that compose the gastro-intestinal parietes, or in one only.

Atrophy of the mucous membrane presents two degrees. In the first, it is characterized by the diminished size of the villi ; sometimes, even, there is no trace of them to be found. In the second, the texture of the membrane itself is singularly attenuated, and it resembles a fine web, pretty like the delicate membrane that lines the maxillary sinuses. The obliteration of the villi is sometimes general and sometimes partial. When the latter is the case, they are not to be found in some spots, while they are well developed in the intervening spaces. This

partial absence of the villi may depend on two
causes ; either on a simple state of atrophy of
the mucous membrane, or on cicatrized ulcers
where there has been nothing as yet reproduced
but the tissue of the membrane.

Atrophy of the mucous membrane is ob-
served pretty often in cases of chronic diseases ;
it may accompany either a state of anæmia, of
hyperæmia, ulcers, or other alterations of tex-
ture.

The muscular coat is also subject to atrophy.
The fleshy fibres which compose it then become
much less apparent ; their fasciculi are sepa-
rated by intervals occupied by cellular tissue ;
and sometimes it is not without difficulty that a
few of them can be found scattered up and down,
thin, pale, and hardly to be distinguished from
the cellular tissue in the substance of which they
are in a manner distributed.

Atrophy of the muscular coat may coexist
with atrophy of the other coats ; but it may, on
the contrary, also occur while others are in a
state of hypertrophy.   Thus, the thickening of
the submucous cellular tissue is frequently ac-
companied by an almost total disappearance of
the muscular coat.   We have already, in the
preceding paragraph, taken notice of this kind
of balance of nutrition.

Lastly, the atrophy may exist at once in all

the tunics of the gastro-intestinal parietes ; these are then singularly attenuated, so as to appear to be composed merely of a very delicate sero-cellular tissue, transparent and colourless : in fact, all that is to be seen is, exteriorly, a serous membrane, and, interiorly, a smooth layer, without villi, apparent vessels, or follicles, and no longer distinctly possessing the characters of mucous membrane.

The splenic portion of the stomach is pretty frequently the seat of this kind of atrophy ; next to that, it is most commonly found in the inferior portion of the small intestine.

§ III. *Softening of the Alimentary Canal.*

One of the most frequent alterations observed in the parietes of the alimentary canal is the diminution of consistence of one or more of the coats which form them.

Of these various coats, the mucous is that which most frequently becomes soft. It may have lost its consistence to such a degree, that there is nothing to be found in its place, for a greater or less extent, but a liquid pulp ; without, however, the consistence of the other coats being in the least diminished. In other cases, all the membranes are simultaneously affected with softening ; and then we find that

the parietes of the stomach or of some part of
the intestines may be torn with the greatest ease
by the slightest pull.

I shall now describe successively, 1. the sof-
tening of the mucous membrane alone ; and, 2.
the simultaneous softening of all the coats.

1. *Of the Softening of the Mucous Membrane alone.*

We have already attempted, in a preceding
article, to estimate the varieties of consistence
that this membrane should naturally exhibit
in its different situations ; and from what we
said it follows, that a degree of consistence such
as to be natural in the colon, for instance, be-
comes, in the stomach or duodenum, a morbid
softening.

Softening of the digestive mucous membrane
is particularly remarkable in the stomach ; ac-
cordingly it is in this organ it has been most
particularly attended to by modern anatomists.

When the mucous membrane of the stomach
begins to soften, it becomes impossible to take
it off in shreds. It is reduced to a pulpy sub-
stance by the gripe of the forceps on attempting
to detach it ; and the slightest attempt to scrape
it off immediately converts it into a kind of pap.
Even in this state, however, it still exists, as a

membrane, over the whole stomach. But, as its softening increases, a period arrives when, before touching it, it is found to be reduced to a pulp of an unorganized appearance, which seems like mucus deposited on the internal surface of the stomach. At a more advanced stage, even this pulp is no longer found uniformly spread over the whole extent of the gastric surface ; in certain parts it is deficient, and in its place is found the bare submucous cellular tissue, possessed of all its usual qualities. Lastly, still later, the parts where the pulp is deficient increase in number, and there are only to be seen a few worn fragments of the mucous layer scattered here and there ; every where else there is nothing visible but the submucous cellular tissue, which retains its ordinary whiteness and density.

This affection may prevail through the entire extent of the stomach ; and there are cases in which it has been well ascertained that the mucous membrane of almost the whole of that viscus, having been reduced to a diffluent pulp, had disappeared. From the cardia to the pylorus, the internal surface of the stomach almost throughout presented nothing but the cellular layer, which was thus immediately in contact with the ingesta.

It oftener happens that the softening of the

gastric mucous membrane is partial, and it is then more frequently observed towards the splenic portion of the stomach. The softening of the mucous membrane of this portion is very often accompanied by a state of dilatation of the veins which run between the coats of the great extremity of the stomach ; in such cases they are visible on its exterior, and their presence has more than once announced a softening of the gastric mucous membrane, before the stomach was opened.

This affection is occasionally still more circumscribed, and occurs only in isolated patches, of which there are sometimes but one or two, and sometimes a great number, the mucous membrane between them remaining in its natural condition. M. Sestier, resident physician at the *Hôpital des Enfans-Trouvés*, shewed me the stomach of a child, on the internal surface of which were ten small patches of a pale red colour, and exactly circular form. They were on a level with the rest of the surface of the membrane, and were each of about the diameter of a half franc piece. Where these were, the mucous membrane could be reduced by the slightest touch to a sort of diffluent pulp, beneath which the other membranes appeared uninjured : between them, it was free from any appreciable alteration. I have seen other cases where

similar patches, instead of being red, were of a deader white than the rest of the membrane ; had they been in the least depressed beneath its surface, they might easily have been taken for ulcers. These circumscribed softenings, when thus confined to the mucous membrane, may be the origin of certain ulcers there ; when extended to all the coats of the stomach, they may be the cause of many perforations of that viscus.

In place of these circumscribed softenings, disposed in more or less regularly circular patches, we sometimes observe another form of the affection, in which the mucous membrane exhibits a certain number of lines, streaks, or sinuous bands, where it has lost its consistence, and is at the same time in a manner sunk ; we then find on the internal surface of the stomach a kind of furrows where one would think at first that the mucous membrane was destroyed, while in reality it is only softened.

Softening of the mucous membrane of the stomach is accompanied by various shades of colouring, which it is important to note. In this respect, the following cases may offer themselves.

Case I. The mucous membrane, while softened in various degrees, may exhibit a greyish tint exactly resembling its colour in the natural state. When that happens, if one was to con-

tent himself with examining the internal surface of the stomach, without applying the scalpel to the mucous membrane, he might consider as sound a stomach that was deeply diseased.

Case II. The softened mucous membrane may be of a paler tint than that of the natural state ; and it then often has a bluish shade through it.

Case III. It is sometimes found of a dead, or milky white.

Case IV. Lastly, it may happen to be of a red or brown colour, which is sometimes uniformly spread over the whole of the softened portion, and sometimes appears on it only in points or spots.

Softening of the mucous membrane of the stomach is a lesion that may be produced either by an acute, or by a chronic process. The introduction of irritating poisons into the stomach often causes it to take place in a few hours, and the mucous membrane becomes at the same time strongly injected.

In many chronic diseases, especially of the lungs, a period arrives when the patients lose their appetite, and digestion becomes difficult ; as for the rest, they have neither nausea, vomiting, nor pain in the epigastrium, nor is the appearance of the tongue altered. The lesion most frequently found in the stomach under

such circumstances is a softening of the mucous membrane, together with one of the shades of colouring above described.

Sometimes, instead of commencing slowly, and announcing its presence only by slightly marked symptoms, the softening takes place by a more acute process, and its existence is indicated by pain in the epigastrium, vomiting, and redness of the tongue. In such cases it is found to be accompanied by a bright redness of the membrane.

Softening of the mucous membrane of the stomach appears to me to be a common affection in old people whose digestion becomes disordered, their health having previously been very good. Their appetite first diminishes, they then lose it entirely, and, soon after, they begin to feel the greatest dislike to all kinds of food. They experience a constant feeling of uneasiness and weight, rather than actual pain, in the region of the stomach; and their tongue, which is usually natural, or else more or less thickly coated, grows red and dry occasionally. This state may continue for several months; the pulse then becomes more frequent, a considerable emaciation takes place, the strength rapidly declines, and the patients die without showing symptoms of a serious affection of any organ up to the last moments. On opening the body,

there is nothing found but a more or less con-
siderable softening of the mucous membrane of
the stomach, with or without injection of its
tissue.

We have just seen that in many cases where,
after death, the gastric mucous membrane is
found softened in various degrees, there has not
been any pain in the epigastrium during life ; or,
at most, the patients have complained only of a
kind of disturbance, uneasiness or weight in that
region. Some, however, have for a long time
had very severe pain in the epigastrium, and
yet no other lesion could be discovered in
their stomachs, after death, than in those of the
others. Here, then, is another case where the
difference of the symptoms is in no wise ex-
plained by the difference of the alterations.

What has been said of the softening of the
mucous membrane of the stomach applies ex-
actly to the softening of that membrane in the
rest of the intestinal canal. I shall therefore
content myself with drawing the reader's atten-
tion to those cases of pretty frequent occurrence
in which the eye cannot detect any perceptible
lesion on the internal surface of the intestines,
the cæcum and colon especially, although there
has been a copious diarrhœa during life. Here,
one would at first be inclined to allow that the
affection took place without any lesion of the

intestine ; but, on applying the scalpel to the mucous membrane, and attempting to detach it, he will in most cases be struck with its extreme softness, and he will sometimes even find it reduced to a pulp devoid of all traces of organization. Thus, then, in certain chronic diarrhœas, the only alteration observed in the alimentary canal is a white softening of the mucous membrane of the end of the small, or of the great intestine.

II. *Softening of all the Layers of the Gastrointestinal Parietes.*

In some cases, the parietes of the stomach and intestines are found liable to be torn by the slightest pull.   If we then examine them where the solution of continuity has taken place, or make a fresh perforation by pressing them gently with the finger, we find that the mucous, muscular, and serous coats, together with the various interposed cellular layers, have lost their usual appearance, and become soft, friable, and in a manner dissolved ; and that they not unfrequently resemble a kind of transparent jelly, which scarcely preserves the appearance of an organized texture.   This is that remarkable lesion to which M. Cruveilhier, who has described it with the greatest accuracy, has given

the name of *gelatiniform softening* ("*ramollisse-
ment gelatiniforme.*") In such cases, before
touching the parietes of the stomach or intes-
tines, one would often take them to be quite
sound, as they are modified only in respect to
their consistence.

This general softening of all the coats may,
like that of the mucous membrane only, take
place, 1. their natural colour being preserved ;
2. they being remarkably pale ; and, 3. their
tissue being red.

The splenic portion of the stomach is the
part where the species of softening at present
under consideration has most frequently been
observed. I saw it involving the whole of the
stomach in two children, of whom one had
taken some sulphuret of potash a few months
before his death, and the other had died with
the various symptoms which characterize acute
hydrocephalus. In the first of these cases, the
whole of the parietes of the stomach resembled
the pulpy part of a red cherry ; there had been
constant vomiting during life. In the second,
the child was in good health, when, without any
known cause, he was seized with vomiting,
which, after having continued for two days, was
succeeded by convulsions, and at last by a coma-
tose state, in which he died, five or six days
after the first attack. The stomach was found

to be softened to such a degree through its whole extent, that wherever pressure was made on its parietes, they were reduced to a pap, and torn ; but this stomach, very unlike the other, was remarkably pale throughout ; and yet the progress of the disease had been acute.

Softening of all the coats has also been found in various parts of the small intestine, cæcum, and colon.

It has been observed to occur at every age ; M. Cruveilhier saw it prevail epidemically at Limoges among young children ; and other authors have related cases of it at all periods of life.

We now come to the question whether softening of the parietes of the stomach or intestines, as well as when confined to a single coat, as when extended to all, takes place only during life ; whether there are not cases where it is merely produced after death ; and, whether, in in the first place, it may not be sometimes the result of putrefaction. It is an undoubted fact that, in proportion as a body putrefies, the tissues composing it gradually lose their consistence, as is particularly evident in the various parenchymatous organs : thus on opening a body ever so soon after from thirty to thirty-five hours after death, in a low temperature, and even sooner in a high, we find the brain, lungs, liver,

spleen, and kidneys, evidently softened. If we then examine the parietes of the alimentary canal, we shall find that they still retain a great degree of consistence, even while the parts already mentioned are much softened : the mucous membrane, in particular, does not begin to soften until signs of advanced putrefaction have appeared in other parts of the body ; whence, I think, we ought to conclude that whenever we discover the mucous membrane to be ever so little softened, without there being as yet any traces of putrefaction in the body, we should not attribute it to that cause.*

It may, then, be established as a general principle, that any softening observed in the parietes of the alimentary canal on opening the body at the usual period after death, should not be considered as the result of putrefaction. But, are we to conclude from this, that every time it is met with, it is to be considered as having taken place during life ? To this question, some reply that a considerable softening of the parietes of the stomach may take place after death, not from putrefaction, but from other causes which do not act until life has terminated. In a thesis maintained in Germany, by Camerer,

* Vid. page 31, for an account of the experiments of M. Billard relative to the softening of the parietes of the alimentary canal by putrefaction.

before Professor Autenrieth, (Stuttgard, 1818,)
we find an account of several examinations of
bodies of rabbits and cats, that had been killed
while in very good health ; in which it is stated
that in all of them the great extremity of the
stomach was softened, and its parietes were in
a manner dissolved, and even, when a sufficient
time had elapsed after death, perforated.   Yet,
when these examinations were made, the bodies
did not shew the least sign of putrefaction ;
while, on the contrary, in the body of a dog al-
ready putrefied, there was no trace of softening
in the stomach.   We see, then, that Camerer
discovered this affection in the bodies of healthy
animals, before decomposition had commenced ;
but did not find it in animals that had died of
disease, nor in those that died a lingering death.
It happened only in those cases where an animal
in good health was killed in a short time after
the reception of food into the stomach, and
during the process of chymification.   Can this
be, as Hunter taught, owing to the gastric juice,
which, having been secreted before death, and
collected in the stomach, may, once that life
has ceased, dissolve the parietes of the stomach,
just as, during life, it dissolved only the organ-
ized, though not living substances, contained in
that viscus ?*   M. Camerer mentions on this

* Vid. page 32.

head a very remarkable experiment, which, if it does not prove the action of the gastric juice on the parietes of the stomach, proves at least that certain fluids contained in softened stomachs may produce softening in other stomachs when introduced into them.   A fluid collected in the stomachs of two children that had died of a gelatiniform softening of that viscus was introduced in the dose of a drachm into the stomach of a man not long dead, which was then kept for twelve hours in a moist heat of 20° R. (77° F.)   At the end of that period, the membranes of the stomach were found dissolved through to the peritoneum wherever the fluid had been in contact with them.   The same fluid was introduced into the stomach of a living rabbit, without producing any bad effect ; and on the animal's being killed its stomach was found in the most healthy condition.   On the contrary, another portion of the same fluid having been deposited in the stomach of the rabbit, after death, its parietes exhibited a pultaceous softening after a certain period.   Now if, during life, the nerves distributed to the stomach from the pneumo-gastric and trisplanchnic be cut on each side, and the same fluid be then introduced into the stomach of the animals thus treated, their stomach softens ; but this effect does not ensue if the nerves be cut without applying the fluid.

Several of these facts appear to me to prove clearly that softening of the stomach should be reckoned as one of the alterations which may take place after death in certain cases. There may have been in the stomach during life a morbid affection of such a nature, as to discover itself to us after death by the softening of the stomach, as it did before that period, by certain well marked functional derangements ; since it may have produced such a state of the stomach as to render it capable of softening after death under the influence of causes, which would otherwise have been either not called into action, or else inadequate to produce that effect.

As to the cause that produces softening of the alimentary canal during life, it is far from being evident in every instance. That it may have been an acute or chronic process of irritation is undeniable ; for it is very plain that such is the case when the gastric mucous membrane, for instance, is found softened in persons who have swallowed a corrosive poison. But here, again, as in all other cases, irritation effects this only by producing in the natural mode of nutrition a derangement which subsequently gives rise to softening or to induration, according to the individual in whom it occurs. But, in many cases, it is only by hypothesis we can admit that a stomach that is found softened has been in a

state of irritation. For, how is its existence to be proved ? Is it from the nature of the external agents which may have been able to affect the patient ? The existence of such agents cannot always be proved, and their mode of action is not always easily determined. Thus, the gelatiniform softening of the stomach so well described by M. Cruveilhier, has been observed by him to occur chiefly in children that were recently weaned, and badly fed ; and some have not hesitated to conclude that the weaning and unwholesome food had been causes of irritation to the stomach : but that is only one side of the question, and we have just as much reason to assert that the softening of the stomach occurred, not because it was exposed to the contact of irritating substances, but because the alimentary principles, being either insufficient, or unsuitable to the nutritive action of the organs, had deranged the nutrition of each in general, and of the stomach in particular. In the same manner, might we add, the transparent cornea becomes soft in animals that are kept on food not sufficiently nutritive. Let not any one, then, imagine that he has quite settled the question by saying that the premature weaning, for instance, softens the stomach only by irritating it. If he attempts to prove the existence of irritation by pathological anatomy, I answer, what part can

shew it less than certain stomachs whose parie-
tes are completely devoid of colour, and exhibit
no change but a diminution of consistence?
Lastly, if he attempts to prove its existence by
the nature of the symptoms that made their ap-
pearance, I repeat an observation that I have
already made, that, of the numerous symptoms
which may arise from an affection of an organ,
all may serve to indicate the seat of that affec-
tion, but very few are capable of discovering its
nature.   Now, those which most frequently ac-
company softening of the stomach are, anorexia,
a sensation of weight in the epigastrium, and
difficulty of digestion ; and can any single one
of them be considered as necessarily produced
by irritation ?

We must acknowledge, then, that, in the
present state of the science, softening of the
parietes of the alimentary canal appears to be
often connected with a process of irritation ;
but that the existence of such a process is not
sufficent to produce it, and that, consequently,
it is neither the sole, nor the necessary cause of
it.

§ IV. *Ulceration of the Alimentary Canal.*

The portion of the alimentary canal at pre-
sent under consideration is one of the parts of

the body in which ulceration has most frequently been observed to exist ; but all parts of it are not equally subject to the affection.   With respect to the frequency of its occurrence, they may be arranged in the following manner :—

1. The ileum in its inferior two-fifths.
2. The cæcum.
3. The colon.
4. The rectum.
5. The ileum in its superior three-fifths.
6. The stomach.
7. The jejunum.
8. The duodenum.

Ulceration of these different parts may be preceded by various lesions, especially the following.

1. The ulcers may be formed in the centre of small red spots, in the intervals between which the mucous membrane is free from alteration. These spots are merely the result of a more or less strong injection of the mucous membrane. There is no proof of the existence of any follicles where they make their appearance.

2. In place of red spots thus isolated, the internal surface of the alimentary canal may, for a certain extent, exhibit a diffused redness, in the midst of which ulcers appear here and there in greater or less number.   In this case, as in the preceding, there is nothing to prove that the ulcers have their origin in follicles.

3. In some cases, instead of being simply in-jected, the ulcerated portion of the mucous membrane is more or less considerably softened.

4. The ulcers are often preceded by a pre-ternatural development of the follicles, and are then formed in them.   This may occur both in the isolated follicles, and in the aggregated ones known by the name of *Peyer's glands*.

The isolated follicles of the alimentary canal, before becoming ulcerated, generally begin by increasing in size : they become gorged and tu-mid, and appear on the internal surface of the intestines like conical knobs of a red or greyish colour.   Sometimes they are but few in num-ber, and sometimes they are in a manner con-fluent, and cover a great part of the internal surface of the small and great intestine.   In a longer or shorter time after this, they lose their conical form, and a slight depression appears on their summit, which, though sometimes owing to an enlargement of the orifice of the follicle, is more frequently produced by an incipient ulcer. This depression gradually becomes more consi-derable ; and, at a particular stage of this pro-cess, the knobs may, in form, be fairly enough compared to the dimpled pustules of small pox. At a still later period, the pimple disappears, being gradually destroyed from its summit to its base ; and in its place is found a circular ulcer,

which either remains isolated, or, as it increases, tends to run into the neighbouring ulcers.

It is not only in the acute state that ulceration is observed to succeed obstruction of the intestinal follicles : it occurs likewise in the chronic state. Thus, after some of them have long remained distended by a matter of a tuberculous appearance that makes them resemble small granules of a dead white colour, we at last observe the process of morbid secretion which had been previously going on in the follicle, to be succeeded by a process of ulceration.

Very often, too, the aggregated follicles at the end of the small intestine, and in the cæcum, which constitute the glands of Peyer, become the seat of ulcers remarkable for their form and situation. Like the isolated follicles, they begin by growing more apparent, and form on the internal surface of the intestine, on the side opposite the insertion of the mesentery, large oblong patches, of a grey, brown, or red colour, which rise above the level of the mucous membrane, and often extend several inches in length. On these patches are sometimes observed a few solutions of continuity, of a circular or irregular form, of small extent, and far asunder. These very superficial ulcers gradually extend both in depth and surface ; at last they run into another, and then, instead of a patch elevated above the

mucous membrane, there appears an ulcer, which is oblong like the group of follicles it has replaced, extends, like them, several inches in length, and, like them, occupies the free side of the intestine. Such is most usually the origin of those ulcers so frequently met with in the lower fifth of the small intestine, and in the cæcum, after severe fevers.

5. In some cases, which however are much rarer than was long supposed, the ulceration of the mucous membrane does not take place until after it has been struck with gangrene ; and the solution of continuity then succeeds the sloughing. This cause of ulceration is very uncommon, and I recollect but very few instances of it. In two of them, a fragment of mucous membrane, of a blackish grey colour, and gangrenous fetor, was attached to the rest of the membrane merely by a kind of narrow appendage, and beneath it was an ulcer.

6. In all the preceding cases, the different lesions we have seen preceding ulceration existed in the mucous membrane itself ; at other times, it happens that the original lesion, which is subsequently to give rise to the ulceration, is not situated in that membrane. This is what is observed to occur, when certain morbid secretions, especially tuberculous matter, take place in the submucous cellular tissue. The mucous

membrane, being irritated by the presence of this matter, becomes congested, and ulcerates like the bronchial mucous membrane, in order to give exit to the tuberculous matter formed without the cavity it lines. It is asserted that such is the origin of those ulcers that are so frequently found in the intestines of phthisical persons : this may be the case in some instances, but is not constantly so ; and in many such persons whose intestines were almost riddled with ulcers, I found nothing to prove that they had originated in tubercles beneath the mucous membrane.

In every part of the alimentary canal, ulceration may result from acute as well as from chronic irritation. In this respect, however, there is a remarkable difference to be observed between the stomach and the intestines properly so called. In the stomach, ulceration is very rarely produced by acute irritation ; it scarcely ever occurs there but after a chronic irritation of long continuance. In both the small and the great intestine, it is frequently produced by chronic irritation, as in the stomach ; but, besides, it very often results from acute.

With respect to their number, size, form, and direction, intestinal ulcers present the following peculiarities.

Their number is very variable. In some cases, there is but a single ulcer in the whole

extent of the canal; in others, a great portion of intestine is absolutely riddled with them. When they occur in the stomach, they are generally but few in number. At the end of the small intestine, they sometimes appear crowded together for an extent of from one and a half to two feet. Lastly, we occasionally find the whole internal surface of the great intestine completely riddled with an immense number of ulcers, which often resemble one another in form and size. They are generally smaller than those of the end of the small intestine, as well as of a circular form, whilst the others are more frequently ovalish. I lately saw a case, where, from the end of the rectum to the ascending portion of the colon, there was not a space of a few lines in succession which was not occupied by ulcers resembling each other with respect, both to form, which was exactly circular in all, and to size, which was that of a five sous piece.

The forms of the ulcers may generally be reduced to the following.

1. *The circular form.* This is often so regular, that the ulcers appear as if made with a punch; and exhibit a strictly geometrical circle.

2. *The ovalish form.* This appears particularly in the ulcers situated in Peyer's glands.

3. *The linear form.* The ulcer here appears

as a narrow groove, which resembles a geometrical straight or curved line.

4. *The irregular form.* This cannot be compared to any geometrical figure ; and, what one would not suppose *a priori*, is the least frequent of all.

The great diameter of the ulcers may be either parallel, perpendicular, or oblique, to the axis of the intestine. They are in general confined to one side of the intestine ; but sometimes they occupy its whole circumference. I recollect having seen a case in which the internal surface of the small intestine exhibited, at intervals, large ulcers, each of which formed, like the portion of intestine it occupied, a perfect ring. There were a dozen such, all disposed in the same manner.

Ulcers of the alimentary canal, like every other solution of continuity, are to be considered as to their margin and their bottom.

The margin of each is formed by the mucous membrane, which may present various appearances. Thus, with respect to colour, the margin of the ulcer is sometimes perfectly white, and sometimes red, or of a more or less deep brown. Moreover, the portion of membrane that forms it may be, 1. in its natural state as to thickness and consistence ; or, 2. it may be softer or harder, thicker or thinner, than natu-

ral.   In some ulcers of long standing, the margin exhibits remarkable alterations of nutrition in the component tissues.   Beneath the more or less thickened mucous membrane which forms it, appears a layer of cellular tissue which is also thickened, and indurated.   From the margin of the ulcer prolongations are sometimes detached, which either terminate in a free extremity, that floats above the bottom of the ulcer, or shoot over and adhere to the opposite side, forming a kind of arch or bridge over it.   In some cases, cicatrization takes place beneath these, which then remain as traces of the chronic ulcer that had formerly existed there.

The bottom of the ulcers may consist of different tissues, and present various appearances which it is important to observe.

In the first place, there are found, both in the stomach and small intestine, very superficial ulcers, which might be better termed *simple erosions*, and at whose bottom the mucous membrane still remains.   However, an evident depression is observable where they exist, and there has been undoubtedly a loss of substance : but it is not the texture of the membrane itself that has been destroyed ; it is only the villi. From their deficiency, in a circumscribed space, results that depression which at first gives the impression of the existence of a complete solu-

tion of continuity of the whole substance of the mucous membrane.

The case I have just described is not very uncommon, but is much less frequent than that where there is no longer any trace of the mucous membrane; we then have a complete ulcer, whose bottom may consist of some one or other of the subjacent tissues. Thus, it very often consists of the submucous cellular tissue, which may be altered, either in colour, consistence, or thickness. For instance, it is found to be red, grey, brown, or deep black, ; soft, and as it were fungous, or hard and scirrhous, according to the case. At other times, on the contrary, the cellular tissue which forms the bottom of the ulcer retains all its natural qualities ; the bottom is then white, while the margin is often equally so. It is not unusual to find in the alimentary canal a great number of such ulcers, which present no other alteration than the solution of continuity which forms them. They are often found in children who have been exhausted by chronic diarrhœa, and, after the complaint has become less severe, or even ceased altogether, have died either in a state of coma, or in convulsions; their death thus commencing at the brain. They are also found in adults who die during their convalescence from gastro-intestinal inflammation.

Instead of the submucous cellular tissue, the bottom of the ulcer may be found to be formed by the muscular layer, whether in the sound state, or altered with respect to colour and consistence. There are cases where the bottoms of all the ulcers in the same subject consist of this fleshy coat. I lately saw a remarkable instance of this in a woman who died at *La Charité*, in a state of great exhaustion, of a diarrhœa of about three weeks' continuance. For an extent of from two and a half to three feet above the ileo-cæcal valve, the internal surface of the ileum was overspread with large ulcers, of which many, that were of an ovalish form, were seated in Peyer's glands. At the bottom of all the ulcers appeared the bare muscular coat, with its circular fibres perfectly marked : it did not present any alteration ; and what was very remarkable, neither the margin nor the bottom of the ulcers exhibited the least appearance of injection ; the intervals between the ulcers were also free from it.

Lastly, the muscular coat itself may be destroyed, and the bottom of the ulcers consist only of the peritoneal membrane, either transparent and thin as in the natural condition, or covered at the side of the cavity of the intestine by a layer of cellular tissue more or less altered, which is that naturally interposed between the muscular and serous coats.

It is not without its use to know that the bottom of ulcers of the intestines may be formed of the different tissues we have just pointed out; for, if we bear in mind that, instead of extending simply in surface, and stopping at the submucous cellular tissue, the ulcers may extend also in depth, and destroy all the coats down to the peritoneum, we shall perceive that this likewise may easily be destroyed in its turn ; whence will arise a perforation.   The probability of the occurrence of this is not to be estimated by the number or size of the ulcers, but solely by their tendency to increase in depth.   Thus, we may find in the alimentary canal an immense number of ulcers, which have existed a very long time, without any perforation having occurred ; while at other times we find but a single ulcer of inconsiderable size, and the intestine perforated in that spot.

It is not sufficient to be acquainted with the various forms of the ulcers themselves ; we must attend also to the different states that may be observed in the mucous and other tissues in the intervals between them.   Now, in the first place, there are cases where there is no appreciable lesion to be discovered in those intervals. The mucous membrane is white and of good consistence throughout, and the subjacent tissues are equally free from alteration : indeed I

have often been struck with this complete disco-
loration of the intestinal tube, while its internal
surface was covered with numerous ulcers. At
other times the membrane around the ulcers,
without being reddened, is found to be either
softened, or studded with a great number of fol-
licles more than usually apparent. It is pretty
commonly found injected, but the injection is
rarely very considerable, even in those cases
where there is every reason to believe that the
process of ulceration was very acute ; so that it
would be altogether inexact to admit, that there
is any proportion between the intensity of the
hyperæmia of the mucous membrane, and the
facility with which ulcers are produced. In
fact, on the one hand, a very strong injection
often exists without ulceration ; and, on the
other, as we have just seen, the internal surface
of the intestine is frequently overspread with
ulcers, without appearing to have received more
blood than usual ; indeed, so far from it, it is in
such cases sometimes remarkable for its great
paleness.

The mucous membrane is not the only layer
of the gastro-intestinal parietes that is found
altered in the intervals between the ulcers. It
happens pretty often, especially in the stomach,
that the submucous cellular tissue thickens and
indurates more or less extensively around a so-

lution of continuity of the mucous membrane.
The ulcer then appears as it were in the centre
of the scirrhous mass, and thus seems to be the
termination of the lesion, whilst it has been its
source.   In such cases, the cellular tissue thick-
ens around an ulcer of the mucous membrane,
just as it thickens around an ulcer of the skin.
The name of *cancer*, then, should either be ap-
plied to both these alterations, which differ only
in situation, or else to neither.

Are ulcers of the alimentary canal suscepti-
ble of cicatrization ?   The best way to answer
this question is by giving an account of what has
been observed in persons that died during con-
valescence, and in whose intestines were found
ulcers in different states, from that in which they
were still in full action, to that in which they
were beginning to disappear.

In a man who died on the fifty-third day of a
severe disease, during the course of which there
had been a copious diarrhœa which continued
to the last moment, the other morbid symptoms
also becoming chronic, I found on the internal
surface of the ileum and cæcum several ulcers,
with elevated margins, and brown, wrinkled bot-
toms.   But, in a few, the bottoms were on a
level with the margins, which were pale ; in
some of these, the bottom consisted of the ordi-
nary submucous cellular tissue ; in others, of an

extremely delicate web, continuous with the margin, and situated above the cellular layer. This web seemed to be the commencement of the reproduction of the mucous membrane.

A woman was attacked with fever, with a brown dry tongue, diarrhœa, and delirium ; from which she recovered. When fully convalescent, in consequence of a surfeit, the fever and diarrhœa returned, great prostration of strength succeeded, and death ensued. On dissection, there were found, towards the end of the small intestine, 1. some greyish patches, of a somewhat oval form, and slightly elevated above the level of the internal surface of the intestine ; (these were Peyer's glands in a state of tumefaction ;) and, 2. in other parts where these glands usually exist, some spots, which were likewise nearly oval, but were evidently below the level of the surface, and consisted of a very soft, delicate, rose-coloured membrane, which when put in water appeared to be without villi, and resembled a portion of the bronchial mucous membrane. Some other scattered points were discovered to be also without villi, while just beside them they were very apparent.

It seems, then, that in the two cases just mentioned, we have instances of the reproduction of the mucous membrane, which, under such circumstances, at first makes its appear-

ance without villi, like that of an excretory duct.

In another case, in a person who died a few months after having had a continued fever with copious diarrhœa, I found, about a foot above the ileo-cæcal valve, a remarkable puckering of the mucous membrane, which was at the same time of a brown colour : the exact resemblance between this and certain cutaneous cicatrices, induces me to think that it also may have been the result of cicatrization. In the same person, Peyer's glands were very conspicuous, and the mucous membrane had lost its villi in some circumscribed spots.

I have on three or four occasions found a puckering resembling that just described in the stomach of persons about whose previous diseases I was unfortunately unable to procure any information. In one of these, a slip of mucous membrane, about four or five lines in length, passed over the puckering, and adhered by its extremities to the surrounding portion of the membrane.

§ V. *Perforations of the Alimentary Canal.*

Ulcers of the alimentary canal, having once reached the peritoneum, may destroy it also, and the result is a perforation of the parietes of the stomach or intestines. Indeed, the more or less

rapid increase in depth of an ulcer is the most frequent cause of those complete solutions of continuity, by which an accidental communication is established between the interior and exterior of the canal.

An ulcer may thus become a perforation in three cases.

1. In persons who appear in good health, or who at least are but slightly indisposed. I shall mention but two cases illustrative of this, though I could easily bring forward many others. A middle aged man had for a long time experienced at intervals pretty severe pains in the epigastrium ; his digestion was rather difficult, but his health did not appear deranged in other respects. He was quite suddenly attacked with all the symptoms of a very acute peritonitis, and died in less than four-and-twenty hours. On opening the body, a sero-purulent effusion was found in the peritoneum, and near the middle of the body of the stomach was an ulcer of the breadth of a franc piece, with a blackish margin, in whose bottom, which consisted of the muscular coat, was a perforation, at most but large enough to admit of the passage of a lentil ; its margin was formed by the torn peritoneum. There was no other lesion in the stomach, nor in the rest of the canal.

I have already mentioned in my *Clinique*

Médicale the case of a young man who, having been taken in at *La Charité* in a slightly feverish state, without any symptom of importance, was suddenly attacked with peritonitis, which put an end to his life in a few hours. There was found in the intestine an ulcer, which had perforated it.

2. We more frequently observe a perforation occurring in the centre of an ulcer, in that dangerous disease to which M. Bretonneau has lately given the name of *dothinenteritis*, in which the internal surface of the small intestine is generally overspread with ulcers.

3. Lastly, we may also observe perforations occurring in persons in the last stage of a chronic affection of the stomach or intestines ; and here, again, their origin has been an ulcer. Thus it is that a peritonitis resulting from a perforation sometimes puts an end to phthisical patients whose intestines contain numbers of ulcers.

However, perforation of the stomach or intestines is not always necessarily preceded by an ulcer. Thus, softening of the stomach, carried to a certain degree, may produce it without any previous ulceration. Besides, we must not forget that we might sometimes chance to consider as produced during life, a perforation that was caused at the time of opening the body by pulling or pressing on the softened stomach.

Again, a slough involving the whole thickness of the gastro-intestinal parietes, may, when thrown off, produce perforation. This has been scarcely ever observed to occur but in two cases; 1. in cases of poisoning by sulphuric acid; and, 2. in strangulated hernia.

Can the gastro-intestinal parietes be so distended with gases, under certain circumstances, as that perforation from mechanical rupture shall be the result? This has been observed to occur in animals; I am not aware that an instance of it has yet been observed in man.

It is in the horse, too, that the stomach has chiefly been observed to burst and become perforated, in the midst of attempts to vomit artificially produced. The rupture has always been observed to take place towards the great curvature; and it may be produced in the same situation, by pressing strongly on a stomach previously distended by fluids or gases. Now, it is known, that the horse cannot expel the contents of its stomach, without extreme difficulty, and the strongest exertions; and the powerful pressure exerted by the abdominal muscles on the distended stomach, under such circumstances, must contribute still more strongly than the contraction of its own muscles, to rupture its parietes. I do not know whether there has been an instance observed in the human subject

of the bursting of a sound stomach in the attempt to expel its contents ; but it has been known to be ruptured, on the same occasion, in persons who had long been affected with a more or less considerable disorganization of its parietes.   A man who had all the appearance of a so called *cancerous affection of the stomach*, took two grains of tartar emetic ; in the midst of an effort to vomit he was seized with severe pain in the abdomen, and died in a few hours afterwards.   On opening the body, there were found, 1. a peritonitis ; 2. a perforation of the parietes of the stomach ; and, 3. around the perforation, traces of a chronic ulcer of the mucous membrane, together with great alteration in the texture of the subjacent tissues.

M. Bouillaud records a case of a person whose stomach, which had long been diseased, burst while he was straining at stool.   In this case, the rupture was caused chiefly by the pressure of the abdominal muscles. The perforation occurred at one extremity of an extensive ulcer, the bottom of which was formed by the pancreas.*

It has been asserted that worms of the species *ascaris lumbricoides* sometimes perforate the parietes of the intestines. I am not acquainted

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* *Archives de Médecine*, vol. i. pag. 534.

with any fact to prove the truth of this opinion ; and in some cases in which worms have been observed coming out of a perforation, it is to be presumed they merely passed through an opening which they found ready made.

Among the causes of perforations of the alimentary canal must be reckoned external violence applied to some part of the abdominal parietes. Thus, in the *Bulletins de la Faculté de Médecine de Paris*, (vol. i.) we have an account of a complete solution of continuity of the intestine, near the union of the colon and rectum, produced by the passage of a wheel over the loins : there was no bone fractured. M. Marjolin * has given us another case of a complete rupture of the small intestine, which was likewise occasioned by a contusion on the abdomen. The skin of the part was uninjured, but the abdominal muscles were torn, and at about eighteen inches from the duodenum the small intestine was completely cut across.

In the various cases we have considered, the causes which produce the perforation of the gastro-intestinal parietes are manifest, and their manner of acting is easily explained. But what explanation are we to offer, when the stomach and intestines become suddenly perforated in

* *Archives de Médecine, vol. ii.*

the midst of a very good state of health ? What are those perforations that are denominated by authors *spontaneous ?* That term was adopted at a time when it was thought that every perforation of the gastro-intestinal parietes was the result of poisoning with corrosive substances. Some cases were observed in which perforations had occurred without the intervention of any external cause to account for them, and they were consequently termed *spontaneous.* If we read over again the observations that were published on this kind of perforation, we shall find that they may be ranged in two classes. Some of them relate to cases in which, before the occurrence of the perforation, there had been more or less strongly marked signs of an acute or chronic affection of some part of the alimentary canal ; while on opening the body the perforation was found in or near membranes that were ulcerated, softened, or in short, altered in some way or other. In others, there is nothing of the kind : individuals in perfect health are suddenly attacked with very severe pain in the abdomen ; they die in a few hours ; and, on opening the body an effusion is found in the peritoneum, and a perforation in some part of the parietes of the stomach, without any other lesion of that viscus, except, in a few instances, a pulpy softening around the perforation. Are

we to say with Hunter and many modern patho-
logists, that such a perforation may be owing to
the corrosive quality the gastric juice can some-
times acquire, by virtue of which it in a manner
dissolves the parietes of the stomach? This hy-
pothesis has already been discussed. Shall we,
then, say that it is the result of a process of irri-
tation that has become suddenly developed in
some part of the canal? But, that is just as much
an hypothesis as the supposition of Hunter.

We must acknowledge, then, that there are
some perforations the cause of which is far from
being yet perfectly known to us. Be it what it
may, an important question presents itself: are
there any certain anatomical characters, by
means of which a so called *spontaneous* perfora-
tion may be distinguished from one which is
owing to the action of a poison? And, are such
characters to be found in the form of the perfo-
ration itself? 1 think not; for I have seen the
perforation affect the same varieties of form
(sometimes the circular, with a smooth margin,
and sometimes the irregular, with a fringed or
torn margin, presenting shreds of various mem-
branes,) both in men in whom it was not pro-
duced by poison, and in animals in which it was.
Shall we then draw these distinctive characters
from the appearance of the parts surrounding
the perforation? They are not at all more cer-

tain; for whether there has been poison in the case or not, the surrounding parts are alike red, disorganized, softened, and gangrened. Lastly, traces of violent irritation may be found in the rest of the stomach, in both cases equally. When, however, there are numbers of sloughs in several spots in the stomach, there is strong ground to suspect the presence of poison, because such sloughs are but very seldom observed in any other case. When, on the contrary, there is no other lesion observed in the stomach but the perforation itself, the probability is that there has not been any poisoning; for it is not easy to conceive how a corrosive substance introduced into the stomach, could act but upon one point precisely. The thing would not, however, be absolutely impossible. It follows from this discussion, that anatomical examination, while it often furnishes no useful information to enable us to distinguish a so called *spontaneous* perforation, from a perforation from poison, sometimes affords a greater or less degree of probability, but never perfect certainty.

Perforations do not occur with equal frequency in all parts of the alimentary canal; they are more common in the stomach than any where else, especially in its splenic portion. In the rest of the alimentary canal, they are seldom observed except at the bottom of ulcers;

while, in the stomach, they are much less fre-
quently preceded by ulceration. Lastly, in some
cases several perforations have been found exist-
ing simultaneously in the same intestinal tube.

No age is exempt from this affection. It has
been observed in children scarcely a few days or
weeks old. M. Cruveilhier has more than once
found the stomach perforated towards its great
extremity, in children that had been affected
with a gelatiniform softening of that viscus.

It would result from some cases, that it
should be reckoned among the serious lesions to
which women are liable shortly after delivery.
Instances of it have also been noticed in persons
who had recently undergone severe operations.

I have hitherto supposed every perforation
of the gastro-intestinal parietes to take place
during life. It has, however, been made a ques-
tion whether many perforations of the stomach
did not occur after death ; and this ought to be
at least discussed by those who think that some
softenings of the stomach do not occur till after
death also.

I have already considered the cases in which
it has been thought reasonable to conclude that
perforations of the stomach may take place after
death ; and do not intend returning to that sub-
ject at present. I shall merely observe that the
cases in which the occurrence of this kind of

perforation has been admitted, because both the stomach and diaphragm were found at the same time softened and perforated, do not prove that it was the fluid that escaped from the perforated stomach which exerted a kind of solvent action on the diaphragm ; for, in other cases, both diaphragm and stomach have been found as much softened, without the latter being perforated. Thus, Jæger has mentioned a case in which, at the same time that the parietes of the great extremity of the stomach presented a gelatiniform softening, and could be torn with the greatest ease by the slightest pull, the softening had extended to the lower third of the œsophagus, and one of the halves of the diaphragm. The individual in whom this was observed was a child a year and a half old, who had presented the symptoms of acute hydrocephalus : in the same subject, the membranes of the brain were strongly injected, and there was some serum in the ventricles.

Perforations of the gastro-intestinal parietes may establish various kinds of communication between the exterior and interior of the stomach or intestines.

1. The most usual communication is that formed between the cavity of the alimentary canal and that of the peritoneum. In such cases that membrane becomes the seat of violent

irritation, and in a very short time the patient dies in great pain, with all the symptoms of the disease known by the name of *acute peritonitis*. This is what generally happens ; but sometimes the contents of the canal escape into the peritoneum without producing any such effects, and give rise only to an obscure lingering irritation, with feebly marked symptoms, and obtuse pain. I shall never forget the case of a young phthisical patient, from whom an *ascaris lumbricoides* came away one day by the navel. He lived for some weeks afterwards ; and every day a small quantity of a matter, resembling that usually contained in the intestines, escaped by the umbilical orifice, which remained fistulous. On opening the body it was found that there had been chronic peritonitis, which had given rise to the formation of numbers of false membranes, among which floated several other ascarides through a fluid remarkable for its dirty grey colour and fetid smell ; this was the intestinal matter which escaped every day through the fistula. Thus, we have an instance of fecal matter and worms escaping from the intestines, and continuing in the peritoneum, without producing any thing but a chronic peritonitis.

2. It sometimes happens that the cavity of the alimentary canal, instead of communicating by perforation with the cavity of the peritoneum,

communicates with the cellular tissue outside that membrane ; this has frequently been observed in cases of perforation of the rectum.

3. The perforation may make a communication between the alimentary canal and the surface of the body ; the perforated point then forms the internal orifice of a fistulous passage of which the external is the perforation of the skin. The stomach, small intestine, cæcum, and colon, have been observed to communicate thus directly with the exterior. Many of these accidental communications form what is called an artificial anus ; and when a similar communication is established between the lower part of the rectum and the exterior, by means of a perforation in its parietes, there results what is called a *fistula in ano.*

4. In some particular cases, when a perforation is formed in some point of the gastro-intestinal parietes, no escape takes place into the peritoneum, because adhesion had previously been established between the intestine and some neighbouring part, which itself subsequently presents various alterations, according to its nature and the lesions it may have undergone.

Most of the abdominal viscera have in this manner served more or less frequently to supply the place of that portion of the gastro-intestinal parietes which had suffered the solution of con-

tinuity, and have thus prevented any escape. Often, for instance, when the parietes of the stomach have been completely destroyed for a certain extent, their place is supplied either by the parietes of the transverse colon, or by the diaphragm, liver, spleen, or pancreas.   All these cases have been observed, and in all were found cellular adhesions closely uniting the circumference of the perforation with the organ which stopped it up.

M. Rayer saw a perforation of the duodenum likewise stopped up by the liver.   In this instance the gall bladder was also destroyed. The patient died of a dreadful hæmorrhage, which was found to proceed from a considerable branch of the vena portæ, that opened into the bottom of the ulcer.

I once found a vast ulcer in the ascending colon, the bottom of which was formed by the substance of the kidney.

If the organs that stop up the perforation have themselves a cavity, their own parietes may in their turn be perforated, and a communication is then established between two natural cavities.   In this manner the interior of the rectum is often found communicating with the interior of the bladder, uterus, or vagina.   Sometimes, also, two portions of intestine that have been united by old adhesions, become perforated,

and communicate together. One of the most remarkable cases of this kind that have been observed is that mentioned by M. Chomel, in which the duodenum communicated with the colon through the gall bladder, which adhered to both, and was itself likewise perforated. Another, equally interesting case, of an accidental communication between two coils of the ileum, has been recorded in the third volume of the *Bulletins de la Faculté de Médecine*. It was observed in an old man of seventy, who died of acute pneumonia. The various parts of the intestinal tube were found adhering to each other by cellular fræna, the remains of an old peritonitis. Between two coils of intestine, in the midst of the uniting fræna, was a small canal three lines long, and eight wide, which established a free communication between them. Its internal surface was lined with a mucous membrane, which was continuous with that of the intestines.

Lastly, not only does the diaphragm often serve as a bottom to ulcers of the stomach, but it may itself be perforated also ; and a communication is then established between the cavity of the stomach and the interior of the thoracic cavity. I have already mentioned some cases of this description.

Hitherto we have seen the perforations of

the gastro-intestinal parietes taking place from within outwards; the process of destruction commencing with the mucous, and ending with the serous membrane. But, the contrary may also occur: when a collection of purulent matter has formed in the neighbourhood of the alimentary canal, this latter is one of the passages by which the pus sometimes makes its way out. Although, in my opinion, the frequency of abscesses of the liver opening into the stomach has been exaggerated, there is yet no denying that, in some cases, of as rare occurrence as hepatic abscess itself is, the contents of those abscesses have been thus evacuated. M. Cayol saw a case in which the ascending colon communicated by a narrow opening with a vast abscess in the substance of the right kidney, to which it was united by cellular tissue remarkable for its great density, and slate-coloured tint.* Abscesses of considerable size, that were formed between the uterus and rectum, have been known to open and empty themselves into that intestine; in one case of this kind,† there was felt during life, behind the cervix uteri, a tumour whose nature was very difficult to determine, which might have been taken for an ob-

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* *Journal de Médecine,* by Corvisart, Boyer, and Leroux; vol. xiv.
† *Ibid.* vol. xvii.

struction of the uterus. Lastly, cases of perito-
neal effusions have been recorded, which were
evacuated through a perforation of the parietes
of the intestines.

§ VI. *Changes of Capacity in the Alimentary
Canal, subsequently to various Lesions of Nu-
trition.*

Increase of capacity in the alimentary canal
has been chiefly observed in the stomach ; in
which situation it has already been treated of.
We have seen that that organ may become large
enough to occupy the greatest part of the abdo-
minal cavity ; in which case its parietes are
rarely thickened, often of the natural thickness,
and sometimes more or less attenuated. This
increase of capacity is mostly accompanied by a
contraction of the pyloric orifice ; in other cases
it is found of the usual size ; and, lastly, in
others, is remarkably enlarged. In these last,
the parietes of the pyloric extremity are some-
times in their natural condition, and sometimes
altered ; and the lesion affects particularly the
muscular coat, of which there are only some
scattered remains to be found, its place being oc-
cupied by a mass of indurated cellular tissue.
Other portions of the alimentary canal are
equally susceptible of acquiring an unusual de-

gree of capacity, when an obstacle to the passage of its contents has long existed in certain parts of it. Thus, I found the duodenum almost as voluminous as the stomach in its pyloric extremity, in an individual in whom the commencement of the ileum was obstructed by a tumour which scarcely permitted any thing to pass.

The capacity of the stomach is often found diminished in certain cases of scirrhous thickening of its parietes. It has also been found very small, indeed almost reduced to the dimensions of the intestine, in cases of poisoning by irritating substances. However, diminution of capacity of the stomach is far from constantly accompanying all the shades of irritation which so often affect that viscus ; so far, indeed, that the stomach is frequently found rather dilated than contracted, in many cases in which it has been the seat of an evident process of irritation, acute or chronic.

Whenever a portion of intestine has long ceased to receive the matter transmitted from the stomach, it parietes contract, and its cavity tends to become effaced. Thus, when these matters pass out altogether by an artificial anus, the portion of the intestine below it has but a very small cavity, whose parietes are as it were agglutinated by a little mucus.

It has been asserted that, in the *Colica Pictonum*, the intestines are so strongly contracted as to present a much smaller cavity than natural. I think I may affirm, from my own experience, that this assertion is by no means founded on truth.

Lastly, there are cases in which the canal, instead of being simply contracted, appears in certain parts as a solid cord, without any trace of cavity; but this very unnatural condition, which has scarcely ever been observed except in the great intestine, belongs chiefly to congenital malformations, and will come under consideration farther on.

The intestinal tube, instead of being contracted or obliterated for a certain extent, may have its cavity more or less completely effaced in a circumscribed point; its contents can then no longer pass that point, and the same symptoms result as those which indicate to surgeons the existence of a strangulated hernia.

The causes that may produce this obliteration of the cavity of the intestine are many, and shall now be enumerated.

FIRST ORDER OF CAUSES.

Obstacles situated in the strangulated Portion of Intestine.

FIRST GENUS.

Obliteration from Alteration of Nutrition of the Intestinal Parietes.

THE parietes of the intestine may, by thickening, produce obliteration of its cavity in some particular point: the same effect may be produced by a vegetation growing on the internal surface of the mucous membrane.

SECOND GENUS.

Obliteration from Substances contained in the Intestinal Cavity.

A foreign body, a calculous concretion, an accumulation of fecal matter, or a bundle of worms, has often proved a complete obstacle to the course of the contents, and produced all the symptoms of strangulation.

THIRD GENUS.

Obliteration from unusual Contraction of the Muscular Coat.

It sometimes happens that, on opening dead bodies, a large portion of the alimentary canal

is found distended by a great quantity of gas up to a certain point where the intestine presents an abrupt circular contraction, beyond which there is neither gas, nor dilation of the cavity. At the spot where the narrowness exists, there is no appreciable organic lesion ; it seems to be produced solely by a contraction of the muscular fibres, which has continued after death, just as that kind of muscular contraction which produces rigidity in the dead body does for a certain period. Now, did this contraction of the intestine exist during life, or did it occur only at the moment of death? There are some patients that present a certain assemblage of phenomena, which one would be inclined to explain by this spasmodic contraction, whether durable or transient, of a ring of the alimentary canal ; but we cannot affirm any thing positively on the subject.

There is another kind of contraction sometimes presented by the muscular coat, in which a portion of intestine, quitting its natural situation, becomes inverted, and enters the adjacent portion. This produces what is called intussusception (or, more properly, introsusception) of the intestine, the meaning of the word being indicated by its etymology. An introsuscepted intestine exactly resembles a finger of a glove the lower part of which has been thrust up into the upper.

Many intestinal introsusceptions appear not to take place till the last moments; and all who have observed the singular contractions that affect the alimentary canal of an animal at that period, will be surprised only that they are not more frequeutly met with in dead bodies. At the same time, it is beyond all doubt, that introsusception may also occur a long time before death; for it sometimes forms a tumour which is perceptible during life through the abdominal parietes, and whose real nature is afterwards discovered by dissection. Be it as it may, in many cases in which an introsusception is discovered, no symptoms that could be referred to it have been observed during life. In others, on the contrary, whether on account of its bulk, or of its situation, it produces various bad effects, one of the principal of which is a real strangulation of the intestine.

In every introsusception, the intestinal parietes are so disposed, that, as M. Dance * has very well explained, the mucous membrane is innermost; next are two serous surfaces in contact with each other; and, more externally still, are two mucous surfaces, also in contact. It is, as the accurate and learned author just quoted remarks, of importance to be acquainted with this

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* *Mémoire sur les Invaginations morbides des Intestins,*

circumstance ; since it can explain how, in consequence of the adhesions that must have a tendency to take place between the two serous surfaces in contact, the introsuscepted portion of intestine has sometimes been detached, and passed by the anus, without any escape taking place into the peritoneum.

Introsusceptions are most usually situated in the small intestine ; which is sufficiently accounted for by its extreme mobility. It is particularly in that situation they occur without producing any bad effects. The small intestine may itself be introsuscepted into the cæcum ; and there is nothing wonderful in that ; but, what one would not have imagined, which yet has been proved by observation, is, that the cæcum and colon may be wholly introsuscepted into the sigmoid flexure of the latter, or into the rectum.

Introsusceptions are very variable in their extent, as it amounts sometimes to but a few lines and sometimes to several feet. There have been cases in which the sigmoid flexure of the colon and the rectum were found to contain not only the rest of the great intestine, but also the most of the small, even as far as the duodenum. This is not all: the introsuscepted portion of intestine may protrude more or less considerably through the anus. Thus, Hevinus presented a

preparation to the old *Académie de Chirurgie,* in which the cæcum was to be seen entangled in the anus, outside which it formed a tumour.

Introsusceptions of small extent, especially when situated in the small intestine, mostly produce no bad effects. At other times they give rise to certain morbid phenomena, resembling those that appear when the course of the contents of the alimentary canal is obstructed in any one point. In some cases, these symptoms are long before they become very severe, increasing in proportion as the introsusception itself increases ; thus for several months, or even years, the individual suffers from nausea, vomiting, and more or less obstinate constipation. In others, the various symptoms that indicate intestinal strangulation appear suddenly in the midst of the most perfect state of health, and death speedily follows : this fatal termination does not, however, always occur ; and sometimes it has happened that, in consequence of the expulsion of the introsuscepted portion by the anus, the obstruction has ceased, and health has been re-established.

Introsusceptions of considerable size often form more or less voluminous tumours in the abdominal parietes. In one of the cases related by M. Dance, in which the great intestine was introsuscepted into the sigmoid flexure of the

colon, there was observed, on the one hand, a remarkable depression of the right iliac fossa, and, on the other, an elongated tumour in the left. In the same case, the abdomen, when opened, presented a very singular appearance : there was at first no trace of the cæcum, ascending colon, and right half of the transverse ; the great intestine did not commence till towards the end of the arch of the colon, and, for the length of eighteen or twenty inches presented a great swelling as thick as the arm of an adult man, round, hard, resisting, and terminating abruptly near the end of the left iliac fossa, where the colon resumed its ordinary conformation.

The introsuscepted portion of the intestine is often struck with gangrene ; and sloughs are then thrown off, producing one or more perforations, through which the contents of the intestines escape into the peritoneum, and give rise to a new series of symptoms.

But, one of the most remarkable phenomena presented by introsusceptions, is the complete separation of the introsuscepted portion, without any escape taking place into the peritoneum ; the detached portion passes out by the anus, and a perfect cure follows. Hevinus saw two cases of this description ; one of the patients passed twenty-three inches of the colon, and the other twenty-eight of small intestine. The pre-

parations were presented to the *Académie de Chirurgie.* M. Cruveilhier shewed the *Societé de la Faculté de Médecine* a coil of intestine eighteen inches long, with some of the mesentery adhering to it. It was passed by a man who for several days had had all the symptoms of strangulated hernia, which ceased as soon as it came away. I had an opportunity of examining a preparation sent to the *Académie Royale de Médecine* by MM. Bouniol and Rigal ; and ascertained it to be a portion of the small intestine, about thirty inches in length, with a small bit of the mesentery adhering to it. The subject of the case had had an excessive surfeit, after which he was seized with all the symptoms that announce strangulation of the intestine ; he had besides in the right iliac region an uneven tumour, which was very sensible to the touch. At the end of twelve days he passed the portion of intestine and mesentery in question ; upon which the symptoms disappeared, and he recovered, retaining only a feeling of pain in the right iliac region. In three months after, having eaten an enormous quantity of cherries, he was attacked with the symptoms of peritonitis, and died. It is a pity the body was not examined ; there would, probably, have been found a rupture of the cicatrice which must have been formed where the expelled portion of in-

testine had been detached. In other cases, however, there has been an opportunity of as-certaining the condition of the alimentary canal in persons who died in a longer or shorter time after having expelled a portion of intestine by the rectum. A case of this kind is related by Hevinus ; a man, who had all the symptoms that characterize internal strangulation, passed a long portion of intestine, composed of the whole of the cæcum, six inches of the ileum, and six of the colon. Twelve days after this he died. On opening the body, the following ap-pearances were observed : the cæcum was want-ing ; the ileum opened into the colon, with which it was intimately united ; at their point of junction was a narrow aperture which led to a collection of pus situated in front of the right kidney, and circumscribed on all sides by false membranes. Another fact of this kind is re-corded in the second volume of the *Bulletins de la Societé Philomatique*. It relates to a man who died forty-four days after having passed by stool a portion of the small intestine sixteen inches in length. M. Dumeril saw the prepa-ration. On examination after death, the follow-ing peculiarities were discovered : " The two extremities of the intestine were perfectly united, and appeared as if their edges had been

bevelled, and then fitted exactly to each other. They had contracted strong adhesions with the peritoneum at their junction; nevertheless their cavity was not sensibly diminished, even at the cicatrice. The deficient portion belonged to the jejunum and ileum."

Introsusception of the intestines has been observed at every age. Monro gives us a case of a child four months old, in whom the end of the ileum, the cæcum, and the right half of the transverse colon, were found in the left half of the same. M. Cayol has related similar cases, in his translation of Scarpa's treatise on hernia. In one of those, the child, who was five months old, was suddenly affected with constipation and vomiting; and a hard tumour, of the size of an egg, was discovered during life in the left iliac region; six inches of the small intestine, and the whole of the colon, were found in the rectum. The other case mentioned by M. Cayol is remarkable for the introsusception being double : the ascending and transverse portions of the colon had in some sort retrograded towards their origin, and become introsuscepted into the cæcum, which, in its turn, was introsuscepted, along with the contained mass of intestine, into the descending portion of the colon. I do not know any instance but this of an inferior portion

of great intestine being taken up into a superior ; in every other case that has been hitherto recorded, the contrary was observed. In the small intestine likewise, the introsusception almost always takes place from above downwards.

SECOND ORDER OF CAUSES.

Obstacles situated without the strangulated Portion of Intestine.

THESE obstacles may be owing to an irregular disposition, either of the peritoneum, or of the intestinal tube itself.

The causes of strangulation proceeding from the peritoneum are the following :—

I. Perforation of the omentum.

II. Perforation of the mesentery.

III. Division of the omentum into several strips which adhere to the abdominal parietes, and are liable to entangle some of the coils of intestine.

IV. Accidental fræna extended like arches ;

A. From one portion of intestine to another :

B. From a portion of intestine to another organ ; thus, M. Esquirol saw a strangulation produced by a frænum extending from the ligamenta lata of the uterus to the rectum. (It was a preparation presented to the *Académie Royale de Médecine.*)

C. From a portion of intestine to the abdominal parietes.

D. From the omentum to another part of the abdomen.

E. From one of the abdominal viscera to another.

V. The mesentery being rolled up like a cord, and involving coils of intestine.

The causes of strangulation proceeding from the intestinal tube itself are the following :—

I. The compression of one portion of intestine by another. One of the most remarkable cases of this kind is that mentioned by Dr. Gendrin.* In a child six months old, who had from his birth suffered under habitual constipation, and continual vomitings, he found a portion of the transverse colon situated between the vertebral column and the duodenum, which confined it like a ligament.

II. The perforation of a coil of intestine, and the escape of another coil, introsuscepted into the first, through the aperture so formed. In this case, the introsuscepted coil is strangulated by the margin of the perforation.†

III. The unusual length of the appendiculum

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* *Archives de Médecine,* vol. viii. pag. 494.
† *Bulletins de la Société Medicale d'Emulation pour* 1822. Case by M. Martin Solon.

cæci, whereby it gets twisted around the ileum, and thus produces strangulation.

IV. Preternatural adhesions of the free extremity of the appendiculum, by which an arch or ring is formed, which readily produces strangulation if a portion of intestine gets entangled in it. .

V. The twisting of a diverticulum around a coil of intestine.

VI. Adhesions of the free extremity of the diverticulum, which, then becoming an arch, may compress any portion of intestine that may happen to slip under it. However, it is not always the entangled portion of intestine that is strangulated ; it has sometimes been known to produce strangulation in another portion, which, by adhering to the free extremity of the diverticulum, completes the ring of which this latter forms a segment.

The various causes of intestinal strangulation that have now been enumerated may occur suddenly or slowly. In the former case, very serious affections, which rapidly prove fatal, make their appearance all at once, without any premonitory symptoms. In the latter, there are observed for a longer or shorter space of time, for months or even years, various symptoms which are all connected with the existence of a greater or less obstacle to the free passage of the contents of the alimentary canal.

Some of these causes do not necessarily produce strangulation. Thus, all the varieties of fræna that have been described are found in dead bodies without such an effect having taken place; but then a single contractile movement of a coil of intestine, made in a certain direction, would have been sufficient to cause it during life.

§. *Congenital Lesions of Nutrition.*

We are not yet acquainted with any case in which the infra-diaphragmatic portion of the alimentary canal was completely deficient; there have always been some vestiges of it, whilst it has happened more than once that there has not been the least rudiment of the cerebro-spinal axis, or of the heart, to be found. These results of observation accord very well with those to which theory would lead us, and afford a confirmation to the principle, that the parts first developed are those which are most rarely deficient; it being now perfectly well known that the alimentary canal is partly formed, before there is any trace of spinal cord, brain, or heart, to be seen. Accordingly monsters have been seen that actually consisted only of a more or less perfect abdomen; but there has never been an instance of a head or thorax being formed separately. Man, when imperfectly

developed, can thus stop at the point which constitutes the complete organization of certain animals, and present, like them, nothing but a simple digestive cavity. But, however simple its organization, the zoophyte can live and multiply, being a natural creature; whereas man, when similarly organized, cannot, because his continuing to exist in that rudimentary state would be contrary to the laws of nature.

Of the different parts which, taken together, constitute the gastro-intestinal canal, the one that is never deficient, is that proved by anatomy to be the first formed; this is the extension of the vesicula umbilicalis, which may be found, either outside the abdomen, along the cord, in form of a small tube, or else in the abdominal cavity, forming a duct of variable dimensions, and terminating at each end in a cul-de-sac. According as the primary duct has extended more or less considerably above, or below, there will be found in the abdomen more or less extensive portions of the small or great intestine. The stomach, being one of the parts of the alimentary canal last formed, is also one of those most frequently found wanting. Sometimes, however, according to Elben, it has been found present, while there was very little appearance of any other part of the canal. If this be true, it would be in favour of the opinion of Wolf,

who maintains that the gastro-intestinal tube is formed in separate pieces, which afterwards unite ; while according to Oken, Meckel, and Geoffroy St. Hilaire, it is formed in a single piece, which exists in the rudimentary state in constantly the same original situation, and gradually lengthens by throwing out two shoots, if I may use the expression, the one, superior, terminating at the cardiac orifice of the stomach, and the other, inferior, ending at the anal extremity of the rectum. Of the various malformations of which I have given a sketch, there are many which seem to confirm, some the one, and some the other opinion.

The congenital alterations of nutrition of the alimentary canal may produce in it faults of configuration, of dimension, and of situation ; and, lastly, imperforation of one or more of its natural orifices.

A. *Faults of Configuration.*

The stomach is sometimes remarkable for the singularly lengthened or rounded form it assumes. In many persons it has a contraction in the middle, which seems to divide it into two parts. This generally proceeds from an alteration of texture or a contraction of the muscular coat, but is sometimes congenital ; and then

seems to indicate in man the first degree of ten-
dency to division of the stomach, a conformation
which becomes more and more marked in beasts.
However, if in man the stomach is naturally but
a single cavity without trace of contraction or
partition, this division does not the less begin to
show itself in him by other characters.   Thus,
the structure of the mucous membrane of that
viscus is certainly very far from being the same
in its splenic and pyloric portions ; their physio-
logical action appears to be equally distinct, and
they have also a tendency to differ in the rela-
tive frequency, and even the nature, of their
alterations of texture.   In some animals, the
difference of organization of these two portions
of the stomach is perceptible to the naked eye ;
thus, in the horse, the whole internal surface of
the splenic portion is lined with a thick epider-
mis.

In some rarer cases, instead of a simple me-
dian contraction, there is observed in the sto-
mach a still greater tendency to division : it is
divided into compartments by one or more in-
complete partitions, which thus give it a kind
of resemblance to the compound stomach of the
ruminantia.   I once saw a case in which from
the internal surface of the stomach there rose
perpendicularly a number of laminæ, several
lines in height, parallel to each other, and oc-

cupying chiefly the two faces of the body of the viscus ; thus reminding me in some degree of the arrangement of that portion of the stomach of the ruminantia known by the name of *mani-plies.*

At other times, the human stomach, far from becoming more complicated, shows a remarkable tendency to become more simple, and loses some of its parts : thus the great extremity has sometimes been found wanting, and in such cases the œsophagus enters the left extremity, as in carnivorous animals.

Fleishman describes a case in which the cæcum presented a remarkable configuration, being completely bifurcated.

B. *Faults of Dimension.*

Cases are recorded by authors, in which the alimentary canal was singularly shortened, the convolutions of the small intestine being less numerous, or altogether wanting, and the length of the canal from the cardiac orifice to the anus scarcely equalling, or even falling short of, that of the individual. Amongst others, one is mentioned in which the gastro-intestinal canal was reduced to the smallest dimensions possible, forming a straight tube which, commencing at the entrance of the œsophagus into the stomach,

terminated, as usual, with the rectum, which occupied its ordinary situation. Thus, then, there have been found in man the three great varieties of extent presented, in the series of animals, by the alimentary canal, which is sometimes longer, sometimes only as long, and, lastly, sometimes shorter than the body of the animal itself.

The stomach is sometimes so little developed that its dimensions do not surpass those of the small intestine, thus resembling the stomach of certain animals, which differs only in situation from the portion of intestine continuous with it.

The cæcum may be completely deficient; in which case the ileum opens directly into the colon; or, at least, if the cæcum does exist, it does not form a cul-de-sac. According to M. Geoffroy St. Hilaire, this absence of the cæcum may be explained by the primary mode in which the great portions of the intestinal tube, the small and the great intestine, run into each other. The appendix vermiformis is sometimes shorter than usual; at other times there is no trace of it to be found.

The increase of dimension of the intestines constitute faults of conformation more numerous and various than those proceeding from their diminution.

Infants have sometimes come into the world

with a stomach of such considerable size as to fill the greatest part of the abdominal cavity. In others the duodenum has been found almost as large as the stomach ; and, in a child that died a week after its birth, it was double. Immediately below the pylorus, which was completely obliterated, it divided into two canals, which reunited at about a third of an inch above the jejunum ; the ductus choledochus opened into the largest of them : there was no other malformation.[*] Sometimes, also, the cæcum has been found either of itself much larger than usual, or provided with a remarkably large appendiculum, or, lastly, really double, presenting two large culs-de-sac, one of which communicated with the colon. This latter is not unfrequently remarkable for its excessive length, and then necessarily presents several flexuosities in consequence of its increased dimensions. Brugnoni mentions a case in which two colons sprang from a single cæcum and reunited at the rectum. In Meckel's plates [†] is a representation of a colon simple at its origin, and near the cæcum, then separated into two cavities by a central partition, and, at last branching out into two dilated portions of unequal size, that float freely in the abdomen,

[*] Calder, Memoires de Médecine d' Edimbourg, 5. vol. 12mo.
[†] Fascicula Anat. Pathol.

and terminate in a cul-de-sac.   It may happen
that the same alimentary canal shall be found
at once increased in size in one part, and di-
minished in another.   Thus, Cabrol mentions
a case of a person who had a stomach so large
that it filled a great part of the abdominal cavity,
while the great and small intestines together
scarcely exceeded the length of three feet.   In
a monstrous fœtus described by M. Geoffroy St.
Hilaire under the name of *podencephalus*, he
found that the small intestine was one-fifth
shorter than the natural size, whilst the great,
the colon especially, had acquired, with respect
both to length and breadth, the enormous de-
gree of development it naturally has in herbi-
vorous animals.

The extent of the alimentary canal is some-
times increased, partially, by means of one or
more appendices, that are attached to it like the
fingers of a glove, and form as it were small culs-
de-sac placed along the course of the intestine,
and communicating with its interior.   These
appendices are known by the name of *diverticula*.
They are most frequently situated on the jeju-
num and ileum, but have been seen on the duo-
denum, and Morgagni found them even as far
as the rectum.   Of their two extremities, the
one is continuous with the intestine ; the other,
which is more or less remote from it, most

commonly terminates in a cul-de-sac, and some-
times floats loosely in the abdominal cavity,
while sometimes it adheres, either to the parie-
tes of the abdomen, to the mesentery, or to
another coil of intestine.   This extremity has
been found more or less open ; thus, Meckel
saw one of these diverticula inserted into the
navel, and there presenting a gaping aperture
through which a probe could be introduced into
the cavity of the intestine itself; the diver-
ticulum, thus forming a kind of umbilico-intes-
tinal canal, was accompanied by the omphalo-
mesenteric vessels, which still remained.   As to
their form, many of these diverticula are found
terminating in a point, others have a rounded ex-
tremity, and some present a series of dilatations
and contractions, or more or less numerous em-
bossments.   They may be only some lines, or
several inches long ; and the size of their cavity
may surpass, equal, or fall short of, that of the
portion of intestine with which they are conti-
nuous.   They spring from the intestine at
various angles, being sometimes perpendicular
to it, and sometimes oblique ; some of them,
even, are almost parallel to its axis, and as it
were lie on its surface. Their number is various :
in general there is but one ; sometimes there
are more ; and as many as six have been found
in the same subject, proceeding at short inter-

vals from the same portion of intestine. The structure of their parietes mostly resembles that of the parietes of the intestines, and is sometimes even more fully developed, the different coats presenting a remarkable degree of hypertrophy. At other times, on the contrary, some of these coats are either but imperfectly developed, or altogether deficient. Thus, the muscular coat may be reduced to a few scattered fibres, that are scarcely perceptible ; or the parietes may consist solely of the mucous membrane, in which case it seems that the diverticulum is formed merely by a hernia of that membrane.

According to Meckel, intestinal diverticula are merely traces of the original intestine formed by the vesicula umbilicalis. In support of this opinion he urges that the spot where a diverticulum is most frequently found, is precisely the one where, as he says, the vesicula umbilicalis begins to lengthen out into an intestine, namely, the lower third of the ileum. But, in the first place, it is not quite certain that the first rudiments of the alimentary canal actually are formed in this spot ; and, in the next, diverticula have been found in other parts, the duodenum and rectum. Besides, there is but one vesicula umbilicalis, whereas several diverticula have more than once been found in the same individual. Meckel

endeavours to get rid of the difficulty by distin-
guishing the diverticula into true and false, and
considers the first only, from their situation,
conformation, and texture, as traces of the um-
bilical vesicle after its transformation into intes-
tine.

C. *Faults of Situation.*

These must be divided into two classes : the
first comprising those cases in which either the
whole or a part of the alimentary canal is situated
outside the abdominal cavity ; the second those
in which it is contained as usual within the
parietes of that cavity, but its different parts no
longer occupy their natural situation. The
most remarkable case of this kind is that in
which there is a general transposition of the
various parts of the intestine, so that what
should be at the right side is placed on the left,
and *vice versâ.* Thus, the great extremity of
the stomach occupies the right hypochondrium;
its pyloric orifice is situated below the false ribs
of the left side ; the three curves of the duode-
num occupy on the left the same situation they
naturally do on the right, and their concavity
looks towards the right side. The cæcum occu-
pies the left iliac region ; the ascending colon is
situated at the left side, and the descending

colon terminates in the sigmoid flexure, which lies in the right iliac fossa. In this case, there is also a transposition, as well of the other abdominal viscera, such as the spleen and liver, as of the thoracic, the vertex of the heart beating at the right side, and the lung on the left having three lobes.

Partial faults of situation principally affect the transverse colon, which sometimes passes in front of the stomach, sometimes is covered by it, and sometimes has its convex side turned downwards, being so disposed as to form an arch whose convexity is below, and much nearer the pubis than the stomach.

To the other class belong congenital hernias. In order to conceive how they are formed, we must recollect that the abdominal parietes are not formed until pretty long after the appearance of the viscera which they are to protect, so that till about the end of the second month, the foetus seems to have its different organs outside the abdominal cavity, while in reality the latter does not yet exist. If the abdominal parietes happen to be arrested in their development, the intestines may present themselves at birth in the same situation in which they are found at the earliest period of foetal life, that is to say, apparently outside the abdominal cavity. The parietes may, moreover, be faultily developed,

being formed behind the viscera, which will then be really situated outside the abdomen ; but then it cannot be said, in such cases, that they have gone out of it, since they had never been contained in it.

The abdominal parietes may be wholly wanting ; and then there is not only no vestige of the different tissues that form them anteriorly and laterally, but the diaphragm itself is also deficient : this generally co-exists with an imperfect development of the parietes of other cavities, such as absence of the sternum, spina bifida, greater or less fissure of the top of the cranium, hare lip, &c. In other cases, but one of the parietes is wanting : this is sometimes the superior, and then the thoracic and abdominal cavities are confounded into one ; it is observed that in such cases the lungs are generally but very little developed. At other times the diaphragm is well formed, and the front of the abdomen is wanting either wholly, or on one side. Moreover, either may be very imperfect with respect to the number and the quality of its anatomical component parts. Thus in place of the muscular partition usually interposed between the cavities of the thorax and abdomen, there may be a simple cellulo-fibrous web, such as exists naturally in certain animals. The front

of the abdomen may also be deficient in its muscular part, and consist only of the cellular, fibrous, serous, and cutaneous tissues. The last mentioned tissue often stops short on the lateral parts of the abdomen, leaving in front nothing but a layer of cellular tissue more or less condensed. In this case, the different tissues which, taken together, form the regular parietes of the abdomen, exist singly, as the tissues that concur in the formation of the parietes of the cranium or spinal canal do in anencephalia and spina bifida. In other cases the deficiency exists only in the median line, and in place of the linea alba is found a longitudinal cleft through which the viscera appear. If it be true that the abdominal parietes are formed of two lateral parts which are at first separate, and afterwards meet and unite in the median line, it may be readily understood that the existence of a cleft in the place of the linea alba indicates an unfinished process of organization.

This cleft itself may diminish, and consist only of an aperture existing at the umbilicus, or near it; and it sometimes happens that the most of the mass of the abdominal viscera is found in front of this aperture. Lastly, in other cases, there is nothing uncommon in the conformation of the abdominal parietes except that

the natural orifices, especially the inguinal ring, are larger than usual.*

D. *Imperforation of the natural Apertures, and preternatural Communication between the Intestines.*

The malformations accompanying this imperforation may be ranged in three classes.

Class I. This comprises those cases in which the cavity of the alimentary canal is interrupted in but a single point of its extent, its parietes still forming one continued whole. The obstruction is often formed by a membrane placed perpendicularly to the parietes of the intestine, and intercepting all communication between the portion of the canal above it and that below. At other times, instead of a simple membrane, of which the perforation would re-establish the continuity of the intestinal canal, the intestine forms a solid cord for a certain extent, in consequence of the intimate agglutination of its parietes. It is in the rectum these different malformations have most frequently been discovered.

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* The plan of this work, and the limits I have marked out to myself, do not allow me to treat of accidental hernia occurring after birth. I could but copy the excellent descriptions of it that have been already given in surgical works, and to these I must refer the reader.

Class II. This comprises the cases in which there is an interruption not only of the canal, but even of its parietes. Thus, the œsophagus has been found completely separated from the stomach, and that from the duodenum, as also the colon from the rectum. The small intestine has likewise been found terminating in a cul-de-sac at a certain height, and the subsequent portion recommencing a little lower down, its extremity being also a cul-de-sac, and then going on as usual to the great intestine.

Class III. In this, as well as in the second class, the intestine terminates in a cul-de-sac in some point of its extent, but there is no trace of it to be found lower down, and its place is occupied only by a cellular tissue. Thus, the great intestine may consist only of the cæcum, or in a rudiment of the colon ; or the latter may be complete, and terminate at the sigmoid flexure by a blind extremity. Lastly, there may be a beginning of the rectum, which remains unfinished, if I may use the expression, and terminates in a belly without any aperture, at a distance more or less remote from the spot where the anus is usually situated.

Whether the anus exists or not, the alimentary canal sometimes presents preternatural communications as well with the exterior, the opening being then at the navel, immediately

above the pubis, or under the penis, as with different hollow organs, such as the bladder or vagina. In this last case, there is a tendency to the confusion of the external orifices of the digestive, urinary, and genital organs, and the formation of a common cavity more or less closely resembling the cloaca in birds.

ARTICLE III.

LESIONS OF SECRETION.

THE lesions of secretion, which frequently occur in the alimentary canal, and form in it various diseases, should be studied, 1. on the free surface of the mucous membrane ; and, 2. in the substance of the different other tissues that contribute to the formation of the gastro-intestinal parietes.

§ I. *Morbid Secretions on the Mucous Membrane.*

These are of two kinds ; the one being the natural secretions merely increased in quantity; the other new secretions.

A. *Natural Secretions increased in Quantity.*

These are the mucus, the perspirable vapour, and the gases.

On opening bodies, one is sometimes struck with the prodigious quantity of mucus on the internal surface of the stomach or intestines. This often forms a thick layer extending over a great portion of the intestine, which, at first sight, might be taken for the mucous membrane itself, and that, too, white and healthy.

Beneath this layer of mucus, the internal surface of the canal may appear in two opposite states.   In the first place, the mucous membrane may be of a bright red, and this is even the most usual case ; but it may also be pale and without the least trace of injection, the increase of a secretion not necessarily inferring the formation of a sanguineous congestion in the secreting organ.   The mucous membrane that lines the superior surface of the tongue presents, in this respect, the greatest analogy with what is found on opening the body in that part of the alimentary canal that is concealed from view during life.   Thus, at the same time that it is loaded with an unusual quantity of mucus, it is itself sometimes of a bright red, sometimes of its natural colour, and, lastly, sometimes evidently paler than natural.

In place of mucus, there is occasionally found in the intestinal tube an enormous quantity of a fluid resembling water.   This seems to be merely the vapour usually exhaled by the

mucous membrane, which, being increased in quantity, appears in the fluid form. In such cases it may be said that the membrane really *sweats*. This remarkable increase of exhalation may take place by an acute process ; as occurs in certain cases of cholera morbus, in which the abundant evacuations that are observed do not always contain bile, and sometimes consist solely of a fluid resembling serum. In such cases, on opening the body, the mucous membrane is found pretty strongly congested, and that is all ; just as a redness of the skin accompanies a perspiration. But, the cutaneous surface is not red and hot every time it gives out an abundant serous exhalation ; it may be covered with sweat, although cold and pale. The same is the case with the intestinal mucous membrane, which, without becoming red, may likewise ex- hale an abundance of serum. On opening the bodies of persons who had had a serous diar- rhœa unattended with pain, at the end of various chronic diseases, I have frequently been struck with the state of the small intes- tines ; their parietes, which were attenuated and remarkably pale, being distended with a serous fluid, sometimes colourless, and sometimes of a slight yellow tinge. Old writers describe, un- der the name of dropsy of the stomach, a lesion which seems to me to have some relation to

that which I have just mentioned as existing in the small intestine. The stomach is in like manner filled with a great quantity of serous fluid, its size is considerably increased, it occupies the greatest part of the abdominal cavity, and at the same time its parietes are exceedingly attenuated. I saw myself a case of this kind, in which the great curvature of the stomach almost reached the pubis, and the fluid that filled its enormous cavity could be seen through the transparent tissue of its delicate parietes. In this case, the stomach presented no appreciable lesion ; very unlike another enlarged stomach already mentioned, in which the pylorus was also diseased.

The researches of modern physiologists have proved, that, in the healthy state, the alimentary canal always contains a certain quantity of gases whose nature has been ascertained by chemical analysis. In the morbid state, these gases sometimes increase in quantity to such a degree as to distend the intestine and produce several bad effects.

Of the various portions of the canal, the colon is the one in which the morbid accumulation of gases most frequently occurs. It may then be distinguished through the abdominal parietes, and thrusts up the diaphragm, sometimes producing a dyspnœa, which may be the more rea-

dily confounded with dyspnœa from hepatiza-
tion of the lungs, as the liver, being pushed up
with the diaphragm, may give a very dull
sound as far up as the right breast.

An increase of the gaseous secretion of the
alimentary canal often accompanies a state of
acute irritation of the mucous membrane ; thus,
it is frequently observed in persons in whom
Peyer's glands are diseased, whether the affec-
tion be simply hyperæmia and enlargement, or,
still more, ulceration. However the single cir-
cumstance of the existence of ulcers in the in-
testinal tube does not necessarily produce an
increase in the gaseous secretion ; in fact, the
ulcerated intestines of phthisical persons are
seldom found distended with gases.

On the other hand, I have more than once
found the intestines greatly inflated without
presenting any lesion after death, in persons
who had died of an acute affection of the brain.
Moreover, it does not appear to me certain,
that, in typhoid fevers, meteorismus necessarily
announces the existence of ulcers in the intes-
tines. Perhaps we should be nearer the truth
in allowing that the production of gas in the in-
testines is often, though not constantly, con-
nected with a state of ulceration ; and that, like
such ulceration, it is an effect of the morbid
cause which produces that assemblage of symp-

toms that have been provisionally designated by the generic term of typhoid fever. We are to observe, again, that the ulcers are chiefly situated in the small intestine, while it is the great intestine that is most frequently affected with tympanitis.

But, if any one should doubt that an increase of the gaseous secretion of the alimentary canal could take place without any lesion of circulation or nutrition in its parietes, I shall bring forward the remarkable fact of tympanitis being so frequently observed in hysterical women. What do we observe in such cases ? An indubitable modification of the innervation, and a tympanitis accompanying this modification sufficiently often to be fairly considered as one of its results. We should then consider what may occur with respect to the secretion of gas, in typhoid fevers, where innervation certainly plays a very great part, whether it be primary or secondary. The mere chemical reaction of the alimentary substances introduced into the digestive passages is often a cause of tympanitis. Veterinary surgeons are well aware, that by feeding sheep in a certain manner, there is such a development of gases produced in their paunch, that they die of suffocation if the gases be not suffered to escape by plunging a trocar into it through the parietes of the abdomen.

B. *New Secretions.*

a. *Blood.* This fluid is occasionally found in the stomach or intestines, both in the fluid, and in the coagulated state ; it sometimes occurs only in small quantities, and then in a few points, and sometimes in such abundance as to distend the parietes of the containing cavity.

The causes of this effusion of blood on the internal surface of the alimentary canal are the following :—

1. A mechanical obstacle to the circulation through the vena portæ : this has already been considered.

2. Irritation of the gastro-intestinal mucous membrane. Thus the introduction of certain corrosive poisons into the stomach produces hæmatemesis : and certain drastic purges cause bloody stools. As for the rest, by varying to infinity the degrees or modes of irritation, we can no more produce at will a hæmorrhage from the stomach or intestines, than we can, a softening or ulceration of the same parts.

3. A sanguineous congestion, which is neither mechanical, as in the first case, nor produced by an evident process of irritation, as in the second. The blood accumulates in some part of the texture of the mucous membrane,

and escapes from its vessels ; which is all that we can discover.

4. Certain states of the blood itself, in which it is so changed as to have a universal tendency to escape from its vessels. This is what occurs in certain cases of poisoning by absorption, and in typhus fevers. In these, the frequent hæmorrhages from the digestive mucous membrane no longer result from a primary alteration of the membrane itself, but are one of the elements of a morbid state which exists wherever the blood has access ; the black vomit in the yellow fever is one of the most striking instances of such hæmorrhages.

5. Lastly, we must not forget that the blood that is found in the stomach or intestines may have been swallowed. This happens in certain cases of abundant hæmoptysis, and, still more, when an aneurism of the aorta opens into the œsophagus. In the latter case, the stomach is found distended by an enormous coagulum.

Whatever be the cause of the presence of the blood in the alimentary canal, its internal surface in such cases is sometimes found more or less strongly injected, and sometimes, on the contrary, very pale. I found it scarcely traversed by a few middling sized vessels, and the capillaries not injected, in a person who sunk in less than an hour under a very abundant

hæmorrhage, which came from the anus during the course of a slight fever. The mucous membrane was covered with a quantity of blood from the commencement of the ileum to the rectum, so that the source of the hæmorrhage could not be mistaken. In neither case is there found in the alimentary canal any special lesion by which it could be discovered after death, from an examination of the canal, that a gastric or intestinal hæmorrhage had taken place during life. Nor was the lesion more peculiar in the cases of two persons who died of hæmatemesis, and were opened by Professor Lallemand of Montpellier.[*] In each, the mucous membrane of the stomach, for an extent of three or four inches, was puffy, and of a crimson colour, permitting the blood to exude from it on pressure, and so easily torn that at the least touch it came off in shreds. Intestinal hæmorrhage is not very uncommon in new-born infants ; M. Billard saw fifteen cases of it in the space of a year, of which eight occurred between the first and sixth day, four between the sixth and eighth, and three between the tenth and eighteenth. In all these cases he could not discover any thing peculiar in the intestinal parietes but that they were more or less strongly injected. Some of the children were

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[*] *Première lettre sur l'Encephale,* pag. 93.

plethoric ; others, on the contrary, pale and weakly. In all of them the lungs, heart, liver, spleen, large abdominal vessels, nervous centres, and their investing membranes, were found gorged with blood. Thus, then, hæmorrhage may take place from the surface of the intestines, as it does from every other mucous membrane, without there being necessarily any serious lesion of the tissue from which the blood escapes. This fact explains to us how hæmorrhage from the alimentary canal can have occurred frequently in the same individual, without being followed by any serious consequences. One of the most remarkable cases of this kind is that described in the 14th volume of Corvisart's Journal, relative to a woman who for fifteen years had had frequent attacks of hæmatemesis, without her health being in any way injured by it. At the end of the fifteen years the vomitings of blood ceased, and were succeeded by a sanguineous exudation from different parts of the skin : the catamenia had always been regular. The hæmatemesis first appeared subsequently to her receiving a blow on the epigastrium from the horn of a cow. In September, 1828, there was at *La Charité* a woman who for several years had had hæmorrhages from the lungs, stomach, and uterus, at different times ; in the intervals between the attacks, none of these or-

gans appeared to be affected with any lesion. But, on the other hand, in the alimentary canal, as in every other part of the body, it happens not unfrequently that constant lesions give rise at intervals to more or less abundant hæmorrhages; they cannot, however, of themselves, account for the hæmorrhage, being only its occasional cause. Thus, we learn from observation, that in many cases in which the stomach is affected with a so called scirrhous thickening of its submucous cellular tissue, the mucous membrane gives out at intervals a sanguineous exudation; and it is a serious mistake to imagine that the hæmatemesis that frequently accompanies the affection known by the name of cancer of the stomach, occurs only in those cases where the mucous membrane is already ulcerated. I have in more than one instance found it appearing perfectly sound, where it lay over a tumour consisting of a mass of indurated cellular tissue, in persons who had had a copious hæmatemesis shortly before their death. I find in my notebook the case of a person affected with scirrhus of the descending colon, who sunk under hæmorrhage from the rectum. On opening the body, there was not the least trace of ulceration to be found in the intestine; the mucous membrane was sound and almost colourless throughout; and where the transverse joins the de-

scending colon, it was raised up by a mass of indurated cellular tissue, which in a great measure obstructed the intestinal cavity. In all these cases, then, we find gastro-intestinal hæmorrhage preceded or accompanied by lesions varying in nature and intensity. There is another, more uncommon, in which there is found on the internal surface of the stomach or intestines a lesion wholly physical, that has been of itself the cause of the hæmorrhage ; this is the solution of continuity of a large vessel, which is then found gaping in the interior of the canal. Such an occurrence is, however, much rarer than one would be inclined to think ; and there are at most but five or six well authenticated instances of it. The following is one, which deserves to be quoted on account of its singularity : it is recorded by M. Prost.*

A man expired just as he was taken in at *La Charité*. On opening the body the stomach was found full of coagula of blood ; in its great extremity was an ulcer, which, from its indurated margin, was evidently of long standing. At the bottom of this ulcer appeared the gaping orifice of a large blood-vessel, which readily admitted a probe.

I have mentioned elsewhere † a remarkable

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* *Médecine eclairée par l'Ouverture des Corps.*

† *Clinique Médicale.*

case of a person in whom a large vessel was found open at the bottom of an ulcer in the stomach, although there had not been any hæmorrhage during life.

It has been said that the most common cause of gastro-intestinal hæmorrhage is the development of varices on the internal surface of the canal. Now, this cause must be, at least, uncommon; since, for my own part, often as I have opened bodies, I have never found, either in the stomach or intestines, any varices properly so called. As I have already said, I have only met with, occasionally, some dilated veins, which had nothing in their appearance in common with those varicose veins on the skin, or around the anus, which from time to time pour out a certain quantity of blood.

b. *Melanosis*. Instead of exuding blood, the gastro-intestinal mucous membrane sometimes exudes a black matter, in which most of the elements of that fluid are discovered, but which differs from it in appearance, and in the circumstances under which it shows itself. This is the same substance which, in the first volume of this work, has been described in a general manner by the name of melanosis.

The alimentary canal of certain animals is naturally coloured by this matter; this is observed particularly in many of the fish tribe. In that of man, and other mammalia, it is to be

considered as a preternatural secretion, but yet as one which in many cases no more gives rise to any morbid phenomena, than are produced in the lungs by the black matter which so often stains both the parietes of the air vessels and the interlobular cellular tissue.

In man, the black matter makes its appearance in the intestinal canal in two states: 1. as a fluid, lying free on the internal surface of the intestine; and, 2. combined with the tissue of the mucous membrane.

I once showed at the *Académie Royale de Médecine* a great intestine whose internal surface was tinged with a black colour as deep as that of Indian ink. This was owing to the presence of a fluid layer deposited on the mucous membrane, which gave a black stain to linen when rubbed to it, as if it had been the choroid. The layer was removed by washing, and the membrane beneath it remained black.

I found the same black substance in the stomach of a woman fifty years old, that died at *La Charité*. It was half full of a fluid as black as ink, which, when rubbed on white paper, gave it a tint resembling what would have been given by the choroid. The internal surface of the stomach, on being washed and wiped, was found sprinkled with a great number of spots of a deep black colour, and of various sizes, the largest being about the size of two-franc pieces,

and the smallest resembling merely black dots. Around some of these spots, the mucous membrane was of a livid red, which was pretty strongly marked for the space of a few lines all round the spot, and became less perceptible as the distance increased. Around the others, between them, and every where else, the internal surface of the stomach was pale, and the mucous membrane presented no appreciable alteration with respect to its thickness and consistence. The black tint was situated in the mucous membrane only, but it occupied its whole thickness, and was equally distinct on both surfaces. In some parts, the cellular tissue subjacent to the black spots was reddish. Where the mucous membrane was stained, it was a little thicker and firmer than elsewhere.

In another subject, instead of the black spots just described, I found long black lines, five or six in number, extending from the pyloric to the cardiac orifice of the stomach : the mucous membrane, which was entire, but somewhat attenuated, was sensibly depressed in their tract; so that they might be compared to traces left on the skin by nitrate of silver. These lines stained linen black, and the colouring matter in this case also seemed merely deposited on the mucous membrane.

In this, and the preceding case, there had

not been during life any well marked sign of a gastric affection. Besides being interesting in a theoretical point of view, they also seem of importance with respect to the application that may be made of them to forensic medecine. In fact, if there was a suspicion of poison, and similar black spots were observed in the stomach, might not a careless or ignorant examiner be led to confound them with the gangrenous patches produced on the parietes of the stomach by sulphuric acid?

Instead of being deposited on the internal surface of the gastro-intestinal parietes, as in the preceding cases, the black matter may be combined with the texture of the tissues which compose these parietes; the mucous membrane then still presents a fine black colour, but it can no longer be removed by washing, and the matter that composes it does not stain linen. This black matter exists specially, 1. at the bottom of the numerous lacunæ that are often very apparent in the duodenum; 2. at the vertex of the villi of the small intestine; 3. at the circumference of the orifices of Peyer's glands. In the first case, the duodenum seems as it were overspread with a more or less considerable number of small black spots. In the second, the internal surface of the small intestine is sometimes dotted with black, and sometimes, when a

greater number of villi are coloured, or when the colouring extends farther than their vertices, presents a uniform black tint. Lastly, in the third case, there are found, in the situation of Peyer's glands, a number of small black points, which form by their assemblage an oval or roundish figure ; they have been pretty accurately compared to the hairs of a beard recently shaved.

c. *Pus.* The mucus usually secreted in variable quantities on the internal surface of the alimentary canal, may be replaced by various other secretions, which are found either scattered through the gastro-intestinal cavity, or contained in the follicles.

The first of these I shall notice is pus ; but it is much less frequently found on the free surface of the digestive mucous membrane than one would imagine. I once found the whole of the colon lined with a deep layer of thick pus, exactly resembling that of a phlegmonous abscess. It is more frequently met with in follicles, which then form on the surface of the intestine small tumours, from which the pus escapes on a slight incision being made in them.

d. *Tuberculous matter.* Instead of pus, the follicles more frequently contain a concrete, whitish, more or less friable substance, resembling the so called tuberculous matter. The in-

ternal surface of the whole intestine is occasion-
ally found studded with a great number of small
white bodies, which are nothing but follicles
filled with this kind of substance.   In man,
those follicles that thus retain their own morbid
secretion rarely attain any considerable size,
being scarcely ever known to exceed the bulk of
an ordinary pea ; but, in the horse, under the
same circumstances, they may become much
larger.   Thus it is by no means unusual to find,
on the interior of the intestinal tube, in horses,
tumours of about the bulk of a small orange,
which are hollow, and generally contain a sub-
stance more nearly resembling the sebaceous
matter furnished by the cutaneous follicles than
any thing else.   On examining these tumours
attentively, we find on the surface of many of
them an orifice that always looks in the same
direction, and through which the contained mat-
ter may be squeezed out by pressure.   It seems
to me very evident that these tumours are no-
thing but follicles altered both in their nutrition
and in their secretion ; the affection being, if I
may use the expression, a genuine *acne* of the
mucous membrane.

     e. *False membranes.* In the two preceding
cases, we have seen that the morbid secretion
remained within the parts that produced it : but,
the contrary may occur ; and, instead of remain-

ing solely in the follicles, a concrete matter, likewise secreted by them, may come out, and spread in a more or less thick layer over the gastro-intestinal mucous membrane. Hence occurs the formation of false membranes on the internal surface of the alimentary canal ; but that may also take place without the assistance of these follicles, merely by means of an alteration of the perspiratory action that resides in every living particle.

The mucous membrane of the alimentary canal is much more subject to the formation of false membranes in its supra-diaphragmatic than in its infra-diaphragmatic portion. In children, for instance, we often find the mouth, pharynx, and œsophagus, lined with a vast membraniform exudation, which ends abruptly before it reaches the stomach. Exceptions to this rule are very rare indeed ; thus, of two hundred and fourteen cases of aphthæ that were observed in 1826 at the *Hôpital des Enfans-Trouvés*, M. Billard found false membranes in the stomach, in but three ; and in the intestine, properly so called, in but two. M. Lélut, to whom we are indebted for an excellent work on aphthæ, has not seen them more frequently in the stomach, and has never seen them in the intestine.

In persons more advanced in age, false membranes on the infra-diaphragmatic portion

are equally uncommon.   I saw a very remarka-
ble instance of it in a young girl of twelve years
of age, in whom all the air passages were lined
with false membranes, which were found also
in the pharynx, œsophagus, and stomach, where
they existed in form of large bands extending
from the cardiac to the pyloric orifice, beyond
which point they did not reach ; the mucous
membrane was much redder beneath them than
in their intervals.

After puberty, the formation of false mem-
branes on the internal surface of the stomach
and intestines is still very uncommon.   I have
never seen any either in the stomach or small
intestine.   I twice found the internal surface of
the rectum, and once that of part of the colon,
lined with a semi-concrete layer resembling thick
cream, in which no trace of organization could
be discovered, and which could not be removed
in a tubular form.   However, cases have been
mentioned of persons passing by stool considera-
ble portions of membranes of sufficient consis-
tence to make an inattentive observer imagine
that the mucous membrane itself was detached
from its subjacent tissues, and expelled by the
anus.

In the few well authenticated cases of false
membranes in the stomach or intestines, they
have been described as follows.

The false membranes found by M. Billard in the stomachs of three children, of whom one was four, and the other two were six days old, appeared to him to consist of an aggregation of small white points situated over the villi of the mucous membrane, to which they adhered strongly, and which were very projecting, tumid, red, and bloody at their extremity. In the cases observed by M. Lélut, he found, like M. Billard, that the false membrane was arranged in points, which in some parts were conical, and covered a considerable space, and in others, were isolated. In two of the cases mentioned by M. Billard, as also in those observed by M. Lélut, there were no follicles apparent in the stomach. In the third case mentioned by M. Billard, there were found along the small curvature several follicles in a state of tumefaction, and surrounded with a red circle ; but it was not in that part of the stomach the false membranes were situated. It seems, then, that the villi take a much more active part in the production of these membranes than the follicles do ; this, however, applies only to the infra-diaphragmatic portion of the alimentary canal ; for, in the mouth and pharynx, as well as in the air passages, the mucous membrane has no villi ; and yet false membranes are formed there much more frequently than in the stomach.

In the intestine, the same arrangement is found as in the stomach, the false membranes there formed appearing to M. Billard like a mass of whitish flocculi, which adhered so strongly to the villi, that they could not be detached by scraping them strongly with the scalpel. Some of them, however, were found in the fæcal matter.

f. *Calculous concretions.* Anatomists have long been aware that calculous concretions may form, or abide, in various parts of the alimentary canal. Thus Bonetus, in his *Sepulchretum anatomicum*, relates a case of a stone almost as large as an egg being found in the stomach of a woman. He mentions another case of a soldier who could not eat without experiencing severe pains in the epigastrium, and in whose stomach was found a calculus of the size of an egg, that weighed four ounces, and was studded with rough points of an ashy colour. Lastly, there is in the same work an account of a person whose stomach contained nine stones enveloped in thick mucus, which all together weighed three ounces three drachms.

More modern observations have shown that concretions of various sorts and forms may take up their abode in the alimentary canal, where their presence may be productive of various bad effects.

The name of intestinal concretions has been given to substances as various in their origin as in their nature. With respect to their origin, they may be divided into three classes : the first consisting of those which are not formed in the alimentary canal itself, but in the liver, or else-where, whence they proceed into the intestine, take up their abode there, and become more or less modified ; the second, of those which are only partly formed in the canal, consisting of a nucleus, which is generally some foreign body, around which certain elementary particles con-tained in the canal collect, and crystallize ; so that without the presence of the nucleus the calculus would not have been formed ; and, lastly, the third, of concretions wholly formed in the alimentary canal.

We may perceive from this that the compo-sition of intestinal concretions must be very variable. In the first place, the concretions of the first class are almost exclusively formed of the component parts of the bile ; and it is even by this they are distinguished. Accordingly they consist of cholesterine, and of the yellow colouring matter and the resin of the bile. We must also refer to the first class a calculus found by Dr. Marcet in the rectum of a child in whom the anus was imperforate, and a preternatural communication existed between the rectum and

the bladder.   This calculus, which was as large as a nut, consisted principally of a mixture of phosphate of lime, and of the ammoniaco-magnesian phosphate.

The composition of the concretions of the second class must be as various as that of the substances that form their nucleus.   Thus, in the intestines of many animals are frequently found masses of hair, enveloped in salts and mucous matter more or less concrete.   This hair is swallowed by the animal when it licks itself.   Concretions of this kind have even received a particular denomination, being known by the name of *ægagropili*.

Amongst the lower order, in Scotland, who live principally on oaten bread, intestinal concretions are often found with their centre consisting of vegetable fibres.   Their external layer is solid, compact, soft to the touch, and composed of saline matter ; in other instances it has a velvety appearance, and consists of very fine fibres closely united.   Balls of oats are sometimes found scattered among them.   Marcet has described these concretions as formed of compact layers, consisting alternately of fibrous substances and of earthy phosphates.   The analysis of one of them gave the following result :—

Animal matter 25.20
Resin 3.90
Ammoniaco-magnesian phosphate . . .   5.16
Phosphate of lime 45.34
Vegetable fibres 20.30
                                      ─────
                                      99.9

The vegetable fibres were cemented together by deposits of earthy matter, consisting of the phosphate of lime, and the ammoniaco-magnesian phosphate; which same salts also formed a coat around the entire mass.

MM. Laugier and Lassaigne found in the centre of a calculus taken out of the intestines of a horse, which consisted of earthy phosphates, a great quantity of small pieces of straw, around which the saline matter had been deposited.

I once found in the duodenum a hard concretion, of the size of a small egg, whose exterior consisted of a whitish, earth-like matter, and in whose centre was a plum stone.

Dr. Crockelt, of the United States, has given an account of a young person, who, while quite a child, swallowed a brass pin, which, when the person was eighteen years old, was passed by stool, in consequence of the administration of a drastic purgative during the course of a bilious fever. The head and half the stem were contained in a spheroidal calcareous concretion.*

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* *North American Medical Journal,* 1827.

One of the most curious instances of intestinal concretions that have been analyzed, is that given us by M. Laugier.*   The concretion in question was pretty large, and completely stopped up the orifice of the rectum ; it resembled felt.   When treated with boiling water, it coloured it, giving out a seventh of its weight of animal matter, of which the smell resembled fæces ; it also gave out a small quantity of hydrochlorate of ammonia and lime.   When calcined, it left eight hundredths of its weight of residuum, which consisted of phosphate of lime, a little silex, and oxide of iron.

In the midst of this concretion was a cavity, containing a nucleus that differed greatly in its nature from the surrounding matter ; it was of a flattened prismatic form, and was covered with a blackish brown crust, a millimetre (.03937 inches) in thickness, and with a smooth, glossy surface.   When a longitudinal section of it was made, its interior presented a great number of cells, arranged like those of bones that have lost some part of their gelatine, though still preserving some elasticity.   It was found on analysis that the nucleus was formed of two substances, the one external, consisting of dried blood, and the other internal, being nothing but a fragment of bone.

* *Mémoires de l'Académie Royale de Médecine,* vol. i.

It is highly probable that the original nucleus of this concretion was the portion of bone, and that this caused an effusion of blood around itself, which in its turn acquired a coating of various substances contained in the intestine.

Lastly, I must not omit to mention, that there have been sometimes found, in the intestines of persons who had taken a great deal of magnesia, concretions formed of that substance cemented together by thick mucus.

Concretions of the third class are in general formed solely of hardened fæcal matter, of the consistence of real calculi.

I think we should also refer to the third class some hard concretions that were passed in great numbers with the alvine evacuations by a young girl in a consumption, and were found by M. Lassaigne to be composed as follows :—

A fatty acid matter consisting of { Stearine in great quantity, Elaine, A particular acid }	. .	74
A substance analogous to fibrine		21
Phosphate of lime		4
Chloride of sodium		1
		100

Whatever be the origin and nature of the concretions, they may, by reason of their form, bulk, and situation, sometimes act as irritating bodies, and give rise to symptoms that do

not cease till after their expulsion, and some-
times act merely by opposing a mechanical ob-
stacle to the free passage of the contents of the
intestines. I shall now give a few examples of
these two kinds of effects.

Case I.* A man, sixty years of age, had for
a long time experienced, whenever he took any
food, violent spasms in the stomach, accompa-
nied by a sensation of burning heat in that
organ, and the eructation of a fluid so acrid as
to ulcerate the pharynx and corrode the enamel
of the teeth ; in addition to this, he laboured
under vomitings, which recurred several times
a day, a continual feeling of weight and distress
in the præcordia, dislike to food, habitual con-
stipation, and almost total sleeplessness ; at last
he fell into a gradual decay.........One day,
while vomiting, he threw up a calculus, which
gave him some relief : the next day he threw up
another. The first weighed a drachm, the se-
cond, half a drachm. Soon after this, he com-
pletely recovered.

Case II. Dr. Camille Piron showed me a
woman who had all the symptoms, both local
and general, of a scirrhous affection of the

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* Case observed by Dr. Helm, of Stolp, translated from the German, in
vol. viii. of the *Bulletin des Sciences Médicales.*

pylorus; which disappeared after she threw up a calculus the size of a nut, which had probably obstructed the pyloric orifice. It consisted almost solely of cholesterine.

Case III.* A child eleven years old had from his infancy been subject to severe pains in the abdomen, and diarrhœa. He was lean, eat little, and was tormented with a burning thirst. In the right hypochondrium was felt a hard tumour, which seemed to belong to the liver. Vomitings set in, and the patient sunk. On opening the body, the intestine was found distended at the meeting of the ascending and transverse colon, by a calculous concretion, six inches in length, and twelve ounces and a half in weight. It was separated from the parietes of the intestine by a layer of thick mucus, and consisted of three portions, articulated, as it were, to one another. The first occupied the ascending portion of the intestine; another, the transverse; and between them was the third, which was concave on one surface, and convex on the other.

Case IV.† A young man, aged eighteen, eat during the month of June 1814 a great quantity of green plums, and swallowed the stones. In

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* *Edinburgh Medical and Surgical Journal*, July, 1825. Translated in the Archives de Médecine, vol. xiv, pag. 254.

† *Archives de Médecine*, vol. ii. pag. 148.

a few months afterwards he began to feel pains in his belly, but not severe enough to prevent him from working. After some time they became more severe, and were accompanied with an obstinate diarrhœa. On feeling the abdomen, a hard circumscribed tumour could be discovered, which appeared to be an alvine concretion, but could not be expelled by any kind of medicine : the patient died in a state of marasmus. On the body being opened, there were found, in the left portion of the transverse colon, three concretions united together, and a fourth a little lower down, in the centre of which was a plum stone.

Case V.* A woman, aged fifty, was attacked with a severe pain in the right hypochondrium. Soon afterwards, she presented all the symptoms that indicate an obstacle to the free course of the fecal matter in the intestine ; such as hiccup, nausea, vomiting of stercoraceous matter, meteorismus, and rapid prostration of strength. These symptoms disappeared after the patient had passed by stool three calculi ; the first of which, in form, colour, and size, resembled a large chestnut, the second was as big as a pigeon's egg, and the third, which was triangular, and flattened, was of the same bulk as the second.

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* *Archives de Médecine,* tom. xii. pag. 432.

They consisted in a great measure of choles-
terine.

In animals, also, similar effects have more
than once been observed to result from the pre-
sence of a concretion in some part of the diges-
tive canal. Thus, we have an account of a
yearling calf, that died in a state of marasmus,
and in whose second stomach, near the entrance
of the œsophagus, was found an *ægagropilus* so
situated as to impede the return of the food
into the mouth, and thus prevent the act of ru-
mination.*

§ II. *Morbid Secretions beneath the Mucous*
Membrane.

Several alterations of secretion may take
place without the mucous membrane, in the
substance of its subjacent tissues, especially the
submucous cellular tissue.

FIRST GENUS.

Effusions of Blood.

There are sometimes found in the submu-
cous cellular tissue more or less numerous ec-
chymoses, which may occupy from one or two

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* *Bulletin des Sciences Medicales,* 1824.

lines to some inches in extent. They may oc-
cur with or without alteration of the portions of
mucous membrane lying over them. The cir-
cumstances under which they appear are chiefly
the following :—

1. Some mechanical obstacle to the free
passage of the blood from the branches of the
vena portæ to its trunk.

2. Irritation of the alimentary canal. No
one can doubt this who reflects that, in men or
animals poisoned by some corrosive substance,
ecchymoses of various degrees of number and
extent have not unfrequently been found in dif-
ferent parts of the canal.

3. Certain morbid states in which hæmorr-
hages occur in all the tissues, in consequence of
an alteration of the blood itself, whether spon-
taneous, or produced by external agents. In
such cases, at the same time that the skin is co-
vered with ecchymoses, they are also frequently
found beneath the gastro-intestinal mucous
membrane. This is what has been observed in
the various diseases known by the name of
*scurvy, typhus, purpura hæmorrhagica, morbus
maculosus hæmorrhagicus Werlhofii, &c.*

SECOND GENUS.

Exhalation of Serum.

Œdema of the stomach or intestines is a dis-
ease that is not very uncommon. It is charac-
terized by the existence of a certain quantity of
colourless and transparent serum in the areolæ
of the submucous, subserous, and intermuscular
cellular tissue. The quantity of serous fluid
may be sufficiently great to increase the thick-
ness of the gastro-intestinal parietes very consi-
derably ; and it may raise up the mucous mem-
brane, either uniformly, or at intervals, so as to
make it appear blistered.

Œdema of the alimentary canal does not oc-
cur with equal frequency throughout : it is much
more unusual in the stomach and small intes-
tine than in the great ; and is sometimes the
only lesion found in the colon of persons who
have had a chronic diarrhœa.

The mucous membrane investing the œde-
matous cellular tissue may be, 1. variously co-
loured ; 2. remarkably pale ; 3. more consistent
and softer than usual ; and, 4. overspread with
ulcers, or with numbers of follicles.

As to the cellular tissue itself in which the
infiltration exists, it may either present no other
alteration, or else it may be in a state of hyper-

trophy, thickening, and induration.   In this case, we find some points where there is, if I may use the expression, a dry induration of the tissue ; it grates under the scalpel, without yielding a drop of fluid ; in others, where the thickness of the tissue, its density, and its colour of a deader white than ordinary, indicate hypertrophy, we find considerable deposits of a serum that presents two remarkable varieties, being sometimes purely aqueous, and sometimes, as if from a kind of tendency to become solid, being of a greater consistence, and resembling a more or less firm jelly.   This is all that is observed in certain cases of induration of the gastro-intestinal parietes, termed *scirrhous degenerations*.   It often happens that, at their circumference, where there is no induration, or trace of thickening of the cellular fibre, some serum is still found infiltrating the submucous tissues.

There is another kind of serous exhalation, which sometimes occurs also in the substance of the gastro-intestinal parietes, but differs from the preceding in that the serum is contained in a serous envelope that forms a regular cyst. This is usually of but inconsiderable size ; sometimes, however, pouches of serous membrane larger than a hen egg have been found developed beneath the mucous membrane of the stomach.

THIRD GENUS.

Exhalation of Fat.

No author, that I know of, has mentioned any case of the production of fat in the submucous cellular tissue. I once observed an instance of it, in which the mucous membrane at the upper part of the small intestine was raised up by a globular tumour of the size of a bean, and of a moderate consistence. The mucous membrane over it was not at all altered. The tissue of this tumour had all the characters of the adipose : it was situated wholly in the submucous cellular tissue.

FOURTH GENUS.

Exhalation of Gases.

One of the frequent effects of putrefaction is the formation of gases in the substance of the gastro-intestinal parietes. When bodies are opened in summer ever so soon after four and twenty hours after death, the mucous membrane of the stomach and intestines is found puffed up in many places by gases accumulated in the subjacent cellular tissue. This emphysema is not, however, in all cases the result of cadaveric decomposition, but sometimes takes place during

life.   The case recorded by M. Jules Cloquet *
is of this description.   A scrofulous patient,
twenty years of age, died at the *Hôpital St.
Louis* in the last degree of marasmus, in conse-
quence of a caries of the vertebral column. The
body was opened shortly after death, before it
had begun to show the least sign of putrefaction.
There was considerable emphysema of the cel-
lular tissue that unites the different coats of the
stomach, so that its parietes appeared to have
been inflated, and in several places were near
an inch in thickness.   The mucous membrane,
which was embossed, was pale and free from
any appreciable lesion.   The two anterior folds
of the great omentum, which are attached to
the great curvature of the stomach, were also
separated from each other by gas, and the same
was the case with the small omentum.   There
had been no symptom denoting any affection of
the stomach, except a complete anorexia for
several days before death.   Similar gaseous ex-
halations have been seen in other portions of
the submucous cellular tissue, especially in the
substance of the parietes of the gall bladder.
In laying before the faculty the case just cited,
M. Cloquet stated that he had often observed
the same kind of emphysema in pigs recently

* *Bulletins de la Faculté de Médecine,* vol. vii. pag. 267.

slaughtered. In one of these, he found another very remarkable kind of emphysema : to the intestines and mesentery were attached in clusters large bundles of membranous vesicles, which were roundish, transparent, and *filled with air* ; they were each appended by a narrow thin vascular stalk. Their size varied from that of a pea to that of a small nut.

FIFTH GENUS.

Purulent Secretion.

This is seldom observed in the substance of the gastro-intestinal parietes. Sometimes, however, there are found beneath the mucous membrane, or between the scattered fibres of the muscular coat, collections of pus that are generally of small extent. Sometimes there is but one, and sometimes several, more or less remote from each other. These abscesses, none of which I have ever seen exceeding the size of a cherry, are more uncommon in the stomach than in the intestines. The pus contained in them is sometimes in a manner encysted, and sometimes merely infiltrated into the cellular tissue. In the latter case, it may be displaced, and extended into a layer of greater or less tenuity, by pressing on the mucous membrane. We must not confound these abscesses, which

are genuine collections of pus in the cellular tissue, with other white tumours produced by follicles containing the same fluid.

They have never appeared to me to produce any particular symptom ; and though they might discharge themselves through the mucous membrane or the peritoneum, they cannot have any connexion with either the purulent stools that occur in certain diseases, or the vomitings of pus reported by some to have been occasionally observed, and considered as arising from abscesses in the stomach.

I once had an opportunity of observing in the parietes of the alimentary canal, a collection of pus, more extensive than those we have been considering, and also differently situated. In the case I allude to, the mucous membrane of the stomach was raised up through its whole extent by a layer of pus nearly three lines in thickness, infiltrated into the submucous cellular tissue. Beneath this layer the muscular coat was found uninjured.

SIXTH GENUS.

Melanic Secretion.

A black colouring matter is occasionally deposited in the submucous and subperitoneal cellular tissues, which in some cases gives them a

uniform tint for a greater or less extent, and, in others, forms in one or more points small tumours projecting more or less considerably on either surface of the alimentary canal.

<div align="center">SEVENTH GENUS.</div>

<div align="center">*Tuberculous Secretion.*</div>

This occurs pretty frequently in the substance of the parietes of the alimentary canal. Tubercles are very rare in the stomach, where I do not recollect having seen them more than twice; they are more common in the small intestine, especially towards its lower part; while in the great, they become rare again. They occur chiefly in three situations: 1. in the submucous cellular tissue; 2. in the lacerti of the muscular coat; and, 3. in the subperitoneal cellular tissue. In all of these, they have the appearance of a small whitish tumour that raises up either the mucous or peritoneal membrane, through which their form and colour are perceptible. They vary in size from the bulk of a grain of millet to that of a pea. Sometimes there are but one or two found in the whole intestine, and sometimes great numbers; they are observed to be particularly numerous at the bottoms and margins of certain ulcers, especially those that occur in persons who have at the same time tubercles in their lungs.

Tubercles may be found in pretty great numbers in the intestines, after death, without having appeared to produce any serious symptoms with respect to the digestive passages. In some patients there has never been any diarrhœa; in others, it has appeared only intermittingly; and, lastly, in others, it has been constant. Therefore, when it does exist, it depends on other causes than on the presence of tubercles in the tissues subjacent to the mucous membrane. In like manner, pulmonary tubercles may exist a long time without being attended either with cough or any other thoracic symptom.

The state, however, in which the mucous membrane is found over or around the tubercle accounts for the variety of the morbid phenomena that have attended their existence during life. In fact, this membrane sometimes does not present any appreciable kind of alteration; sometimes it is merely injected, and the injection may have been intermittent like the symptoms observed during life; and, lastly, sometimes, whether injected or not, it presents various alterations which must have been constant, like the symptoms themselves.

In the intestines, as every where else, the production of tubercles is the possible result of every cause that has a tendency to derange the

natural process of nutrition and secretion that takes place in every living particle ; there too, as in every other part of the body, one of these causes may be irritation, whether acting primarily on the tissues subjacent to the mucous membrane, or propagated to them from it. We must not forget, moreover, that the source of the production of a submucous tubercle may have been a more or less intense irritation of the mucous membrane, even in those cases where there is no appreciable sign of any lesion found in that membrane after death. But while irritation of the mucous membrane is frequently the first element in the formation of intestinal tubercles, these, when once formed, may in their turn become a cause of irritation to that membrane. Hence arises a new series of phenomena : the tubercles, acting like foreign bodies, produce by their presence the destruction of the superincumbent membrane, and the result is an ulcer through which the softened tubercle escapes, just as in the lungs it makes its way through an ulcer of the bronchia.

ARTICLE IV.

ENTOZOA OF THE ALIMENTARY CANAL.

The entozoa that are found in the intestines

of the human subject, belong either to the *ne-matoidea* or to the *cestoidea*.

Those of the former class are three in number : namely, the *ascaris lumbricoides*, the *trichocephalus*, and the *oxyuris*.

Those of the latter are two : the *bothriocephalus* and the *tænia solium*.

I. *Ascaris Lumbricoides.*

I have already given the anatomical description of this entozoon in the first volume. It resides most commonly in the small intestine, where it is sometimes found in great numbers in the dead body ; it is also found, though much more rarely, in the great intestine, stomach, œsophagus, and pharynx. These worms sometimes quit the alimentary canal, and make their way into different neighbouring parts. M. Blandin and I once found, at the *Hôpital des Enfans,* an ascaris in the cavity of the larynx ; it occupied the space between the cordæ vocales, and part of its body was still in the pharynx. The child had been suddenly attacked with extreme dyspnœa, and died very shortly afterwards in a state of asphyxia. M. Paul Guersent showed me a liver perforated in different directions by ascarides that seemed to have got into it from the duodenum through the ductus cho-

ledochus. I know of but one similar case, which is to be found in the 2nd volume of the *Bulletins de la Faculté de Medecine de Paris*.

Ascarides have been known to pass through a perforation in the intestinal parietes into the peritoneum, and either continue there, escape through a fistula opening externally, or make their way into some other hollow organ, such as the bladder or vagina.

It may be asked whether they can pass from the intestine into some other organ only by means of an accidental aperture which they find ready made, or whether they can make that aperture themselves ? If the latter case ever happens, it is at least exceedingly rare. They have sometimes been found adhering strongly by their oral extremity to the intestinal parietes ; and it has been supposed that that was the commencement of the process by which they make their way out. But if we reflect that they cannot live any where except in the alimentary canal, we shall find reason to conclude that, even supposing they could perforate its parietes and so make their escape, the conservative instinct would prevent their doing so. The case might, however, be different after the death of the animal in which they had existed; as they might then have a much greater incentive to attempt their escape. Bremser mentions some facts on

this head, which, although not relating to the human subject, deserve, I think, to be brought forward here. Some fishes that were put into vases of pure water, died after a few days. In one of them was found an echinorhynchus which had made a passage for itself not only through the parietes of the intestine, but also through the muscles and integuments. Bremser supposes that the creature, after the death of the fish in which it lived, had made its way out in search of food, but, not finding in the water either suitable nourishment or residence, and *perceiving*, to use the author's own words, *that it had arrived at the limits of its own world*, had determined to re-enter ; for it had evidently endeavoured to make its way back into a different part of the body from that through which it had got out. In others of those dead fishes, worms of the same kind had perforated the intestinal canal, and were found fixed, some to the internal parietes of the abdomen, and others to the external surface of the intestines.*

We learn nothing from pathological anatomy respecting the causes which favour the production of these entozoa. They are found in every possible condition of the intestine, which may be indifferently red, or pale, dry, or abounding in

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* *Traité sur les vers intestinaux*, by Bremser, 1 vol. 8vo. p. 351.

mucus. Where there are numbers of them to-
gether, the surrounding portion of the intestine
is often red, and the group which they form is
frequently enveloped in a mass of mucus. In
such cases, however, the increased vascularity
of the intestine and the mucous secretion ap-
pear to be merely the effects of the presence of
the worms, which then act like foreign bodies.

Those pathologists who have endeavoured
to explain the formation of intestinal worms, by
attributing it to a peculiar degree or mode of in-
testinal irritation, and those who ascribe it to a
state of weakness or want of tone in the alimen-
tary canal, have alike given way to a favourite
hypothesis. The fact is, that their formation de-
pends on neither of these causes, but on some pe-
culiar *modification*, the essence of which is un-
known to us, but which appears to be specially
produced under the influence of certain condi-
tions, either inherent in the individual, such as
constitution, age, &c., or external, such as food,
particular states of the air, &c. To enter into par-
ticulars on this subject, would be foreign to the
plan of this work. I shall only remark that in
this case also, what we learn from pathological
anatomy is very trifling in comparison to what we
can discover by other methods of investigation ;
since by it alone we could neither arrive at any
rational theory of the formation of intestinal

worms, nor discover the proper method of treatment.

II. *Trichocephalus.**

This entozoon, which in organization resembles the preceding, is from an inch and a half to two inches in length. Its anterior extremity is much thinner than its posterior, as its name indicates, and terminates in an exceedingly fine point, so that the mouth is scarcely perceptible. The male is distinguished from the female in this species, by the circumstance of its posterior extremity being spirally coiled on itself. Slender as the body is, there is found in it a straight alimentary canal, surrounded by numerous spermatic vessels or oviducts.

The trichocephalus resides principally in the cæcum, and is generally found in great numbers ; like the ascaris, it is much more common in children than in adults. Rœderer and Wagler have found it in quantities in the great intestine.

III. *Oxyuris.*

This species is much shorter than the pre-

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* This worm at first received the name of *trichuris,* its head having been mistaken for its tail.

ceding, but somewhat thicker : the male seldom exceeds from a line to a line and a half in length ; the female, which is larger, is four or five lines long. Its posterior extremity terminates in a point, whence it gets its name of *oxyuris*, instead of that of ascaris, by which it was formerly known. Its organization is the same as that of the ascaris lumbricoides and trichocephalus.

The oxyuris has a special habitation, being found almost exclusively in the rectum, where it occurs sometimes in thousands : it is very common in children.

Bremser doubts the accuracy of those cases mentioned by various authors of the oxyuris being found in other parts besides the great intestine ; though Bloch related a case in which worms of this species were contained in a cyst formed in the substance of the parietes of the stomach ;* and Brera assures us that he found a great number of them in the œsophagus of a woman who died of a slow nervous fever.

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* I have often found in the substance of the parietes of the stomach of the horse, hard tumours of a cellulo-fibrous texture, full of cells containing small white worms, very lively, some lines in length, and of a cylindrical form ; many of these had left the cells that seemed their habitual abode, and were spread over the internal surface of the stomach. Can these entoza have been the same that were seen by Bloch ?

IV. *Tænia.*

This entozoon differs from the preceding in many respects, especially in its size, form, and organization. It is never less than several feet in length, and is sometimes many fathoms long. Vandoeveren has recorded the case of a person who passed a portion of tænia one hundred and fifty feet long, and Rosenstein mentions another where it was three hundred.

The tænia has a flat body, composed of a series of joints, each of which is provided with lateral pores. Its anterior extremity, which is very delicate, terminates in a square head, furnished with four small suckers, between which appears, more or less plainly according to the species, a mouth or proboscis, surrounded by a crown of retractile hooks.

The interior of the tænia presents only an amorphous cellular structure, without any trace of distinct organs. In fact the creature has merely the first rudiments of an alimentary canal, represented by a mouth or proboscis. Very distinct undulatory movements have been observed in it.

The tænia inhabits the small intestine; sometimes, however, it has been found in the stomach. There may be several in the same person. Un-

like the preceding species, which exist principally in children, the tænia occurs most frequently in adults. It is found much more commonly in the dog than in man, and, apparently, is not productive of any inconvenience to that animal; for I have frequently found enormous tæniæ in the intestines of dogs that had been sacrificed to physiological experiments, while appearing to enjoy perfect health.

In man, there are two species of tænia. The first is the *tænia armata*, also called *tænia solium*, *tænia longannulata*, and *tænia cucurbitina*. It is the detached joints of this worm that have received the name of *vermes cucurbitini*. Towards the head, it is no more than a quarter or a third of a line in breadth; lower down it becomes so broad as six lines. Its head is furnished with hooks; and, of the two free margins of each joint, one only is provided with a pore.

The other species of tænia is known by the name of *tænia lata*, *tænia inermis*, and *bothriocephalus*. This generally is inferior to the other in length, but its breadth is greater; each of its joints is shorter, and provided with a pore at each side, which last is one of the best characters to distinguish it from the *tænia solium*. Its head is not furnished with hooks.

ARTICLE V.

STATE OF THE ALIMENTARY CANAL IN THE DIFFER-
ENT CASES WHERE ITS FUNCTIONS ARE DERANGED.

We have now reviewed all the alterations of the alimentary canal that pathological anatomy can discover to us by the present means of investigation. If each of these alterations invariably produced during life a determinate group of well marked symptoms, we could easily tell what had occurred before death, from the appearances observed after it ; but such is by no means the case : for of all the parts of the body, the alimentary canal is that in which identity of lesions least infers identity of symptoms either local or general. Having premised these few observations, we shall now attempt to answer the following question : Given the different groups of symptoms to which particular names have been assigned, what is the state of the alimentary canal after death in each case?

The greater number of the functional derangements to which the alimentary canal is liable, have been of late referred to a state of irritation of the part, indicated in the dead body, 1. by various degrees of sanguineous congestion ; and, 2. by various alterations of nutrition and secretion. According to the portion

affected, the assemblage of symptoms has been designated by the names of *gastritis, enteritis, colitis, gastro-enteritis, entero-colitis, duodenitis, dothinenteritis, &c.* These expressions may be adopted, provided we consider them only as provisional terms, the use of which is to suggest to the mind certain alterations, of which irritation is the common connecting link, or occasional cause, but which, at the same time, differ widely in their nature and causes, as well as in the functional derangements they produce, and the treatment they require. I shall now proceed to examine each functional derangement separately, and inquire to what anatomical condition of the alimentary canal it corresponds.

§. I. *State of the Alimentary Canal in its various functional derangements.*

These derangements may be classed as follows :

Class I. Modifications of hunger and thirst.

Class II. Modifications of the phenomena of chymification-dyspepsia.

Class III. Modifications of the phenomena of secretion and excretion.

Class IV. Modifications of sensibility.

FIRST CLASS.

Modifications of Hunger and Thirst.

The sensation of hunger may be either increased (*bulimia*), diminished (*anorexia*), or perverted (*pica*). We are now to inquire what is the state of the alimentary canal in each of these cases.

Bulimia has been attributed by some authors to particular lesions, such as an unusual dilatation of the pyloric orifice, the opening of the ductus choledochus into the stomach, too abundant secretion of the gastric juice, the stomach being larger than natural, or the intestine shorter ; and, lastly, to the presence of worms in the alimentary canal. These lesions have in most cases been admitted as causes of bulimia, rather from theory than from actual observation, but in this, as indeed in almost all theories, some valuable facts have been observed and recorded. Thus, in a case of a galley-slave remarkable for his voracious appetite, Vesalius asserts he ascertained that the bile flowed directly into the stomach. Tarara, a celebrated glutton, whose history has been given by M. Percy, had a stomach of enormous size ; and Cabrole tells us that, in a person who was continually tormented with insatiable hunger, he found an enormous

stomach, terminating in an intestine which, from the place where the pylorus usually exists, to the anus, was only three feet long. However, it may be fairly questioned whether the unusual size of the stomach in great eaters, instead of being the primary cause of hunger, is not rather the effect of the great quantity of food they are in the habit of introducing into it.

Bulimia may be produced by a state of irritation of the stomach. It occurs in certain forms of chronic gastritis ; but in these cases no sooner is the least quantity of food introduced into the stomach, than total anorexia succeeds to the importunate craving which the patient had previously felt. Many persons labouring under chronic gastritis experience an uneasiness or sensation of dragging in the epigastrium, which they are apt to mistake for hunger.

Bulimia may be completely independent of the state of the stomach, being connected with an habitual or temporary excess of activity in the general nutritive process. Thus, it is frequently observed at the period of puberty, in children when growing rapidly, in convalescents, and lastly, in pregnant women ; so that we have here one of the thousand instances of the necessity of seeking the cause of a functional derangement at a distance from the organ whose function is affected.

Anorexia is the most constant attendant on all the different morbid alterations of the stomach already described. There are some serious affections of that organ, such as considerable softening, ulceration, and induration of the submucous cellular tissue, which do not give rise to any other symptom ; whilst on the other hand, cases have more than once been observed of circumscribed lesions of the stomach where the appetite was not at all diminished. Lastly, in some persons, who had for a length of time the greatest aversion to every kind of food, I have not been able to find in the stomach any lesion that could account for it : M. Louis has recorded several cases of the same description.

Anorexia may, like bulimia, have its cause in other parts besides the stomach. It occurs during the course of most acute and chronic diseases. Modifications of the nervous influence are likewise a frequent cause of anorexia ; for we know that a moral emotion, or a strong intellectual exertion, is sufficient to produce a sudden suspension of the appetite. Muscular fatigue, when carried to excess, also produces the same effect. In these various cases, a modification of the innervation changes the regular action of the stomach, as it does that of the skin, kidneys, liver, &c.

There are certain states of the system in

which most of the actions of the life of relation
become suspended, the secretions either cease
altogether, or are greatly diminished, and seve-
ral weeks may elapse without the introduction
of any food into the stomach. Such a state oc-
curs naturally every year in hibernating animals.
It is probable that, in this singular condition,
the process of nutrition of the organs is also
suspended, whence the possibility of the crea-
tures doing without food for a very long time ;
so that here also the modification of the func-
tions of the stomach is only an effect of the mo-
dification impressed on more general functions,
whose integrity is necessary to the due accom-
plishment of those of that organ. Thus, by vir-
tue of the *consensus* of all the living parts, the
functions of assimilation can only continue per-
fect so long as the stomach digests properly ;
and the stomach can digest properly, only so
long as there is no derangement in the various
functions whose business is to supply or assi-
milate the nutritive matter to the different tis-
sues.

Pica may likewise occur as a symptom of
chronic irritation of the stomach ; but, in gene-
ral, it would be vain to seek for the cause of it
solely in the state of that viscus ; it occurs chiefly
in certain morbid states, where both the blood
and the nervous system have been primarily

modified : in such cases, hysterical, chlorotic, or
pregnant females, take a pleasure in eating
chalk, as they do in breathing fetid effluvia ;
and certainly no one would take upon himself
to assert that a girl in whom the catamenia are
irregular has a coryza, because a smell that is
disgusting to every one else, is eagerly sought
after by her.

From what has been said it appears that the
cause of all the different modifications of hun-
ger may reside either, 1. in the stomach itself ;
or, 2. out of that organ in the different tissues
for which the stomach prepares the matter to
be afterwards assimilated by them ; or lastly, in
the nervous system, or in the blood ; the modifi-
cations of either of which necessarily produce
modifications of every vital action.

The modifications of thirst may likewise be
referred to the same causes.   This affection is
often symptomatic of gastric irritation ; it is also
frequently the result of some abundant evacua-
tion which has deprived the blood of its proper
quantity of serum.   Thus, an ardent thirst oc-
curs after abundant perspirations, and generally
attends on diabetes.   It is, then, far from being
proved that a person labouring under fever is
affected with gastric irritation because he feels
great thirst ; he may be thirsty merely because
his blood contains too little serum, which is *per-*

haps the origin of the thirst, as well as of the whole disease. It may be said, that this is all hypothesis ; but it must be allowed, that it is equally hypothetical to assert that in such cases the origin of the fever is in the stomach, because the patient is thirsty and his tongue is red. I would ask, is it also necessarily the stomach that reddens the conjunctiva and injects the skin, in those cases ?

SECOND CLASS.

Modifications of the Phenomena of Chymification.

It is now useless to set about proving that dyspepsia, in all its forms, may be the result of gastric irritation. This has been already demonstrated by M. Broussais, and undoubtedly one of the most valuable services he has rendered the science of medicine, is his having taught practitioners to treat and cure by antiphlogistics a great many forms of dyspepsia which were formerly attributed to a weakened state of the stomach. But yet, it may fairly be questioned, whether every case of dyspepsia necessarily results from gastric irritation. The practice of most French physicians of the present day would apparently authorize our answering this question in the affirmative ; but at every period of medical science we find the practice

regulated by the prevailing theory, and its effi-
cacy proved by its successful results. It is,
however, perfectly well ascertained that some
cases of dyspepsia, which had resisted the anti-
phlogistic treatment, yield readily to other reme-
dies that are any thing but debilitating. And
it is equally well ascertained, that in persons who
have long suffered from indigestion, the stomach
often presents no anatomical lesion sufficient
to account for it ; and even in those cases where
lesions of the stomach are found, it is by no
means clear that they have been produced by
irritation. If we proceed to investigate the
symptoms which attend on this lesion, we find
that there are some which, when combined and
strongly marked, appear to be so little the re-
sult of irritation, that they are advantageously
treated, nay, speedily removed, by means that
are themselves irritating.

Thus, whether we consider the appearances
found after death, the symptoms presented
during life, or the results of the different me-
thods of treatment, we arrive at the conclusion,
that there are several kinds of dyspepsia, each
of which indicates a peculiar state of disease,
and requires a particular mode of treatment.

FIRST GENUS.

Dyspepsia from Gastric Irritation, acute or chronic.

This is, beyond all contradiction, the kind of dyspepsia most commonly met with.

SECOND GENUS.

Dyspepsia from Weakness of the Stomach.

This is observed to occur, 1. under the influence of causes altogether unknown ; and, 2. subsequently to certain appreciable modifications of the system. Thus, it sometimes happens that the stomach, after having been more or less irritated, falls into the opposite state, and becomes affected with genuine atony. The same happens in some cases of convalescence. This state of atony likewise occurs in persons exhausted by excess in venery, and, still more, by onanism. It would be a serious mistake in such cases to imagine that dyspepsia is always the result of gastric irritation ; for that would lead to the employment of remedies which frequently aggravate the complaint. Under such circumstances, I have seen dyspeptic affections yielding rapidly to a tonic regimen, which could not have failed to exasperate the irritation of the stomach, if such there had been. Why may

there not be weakness of the stomach as well as of the muscles in those cases? Dyspepsia from weakness of the stomach is generally attended with a complete absence of thirst, and great paleness of the tongue. The patient experiences, after taking food, a sensation of weight in the epigastrium, and frequently a tension in the same region. The use of gum water sometimes produces these symptoms, as do also the infusions of linden and chamomile, though in a less degree. This particular state of the stomach may render the pulse somewhat more frequent; but, as we have already seen more than once, frequency of the pulse is not necessarily connected with a state of irritation.

THIRD GENUS.

Dyspepsia from Alteration of the Follicular Secretion of the Stomach.

There is a peculiar morbid state of the stomach that has long been distinguished by French practitioners by the name of " *embarras gastrique,*" the nature of which is far from being well known. It is characterized by a certain assemblage of symptoms, local and general, does not yield at all to blood-letting, and but slowly to diet, while it readily gives way to emetics and purgatives. That the symptoms which attend

this affection are often connected with irritation of the stomach, and that they are then exasperated by tartar emetic, has been proved by experience; but that it is, in every instance, merely *gastritis*, and not a disease of another kind, and requiring a mode of treatment as peculiar as the symptoms that announce it, is a conclusion totally incompatible with observation.

It may be presumed that one of the causes of this affection is an alteration of the mucous secretion of the stomach, and I do not see why such an alteration should be considered as necessarily the result of irritation, unless we choose to allow that the mucous coating that sometimes covers the tongue necessarily indicates glossitis.

FOURTH. GENUS.

Dyspepsia from Modification of the Nervous Influence.

We know that the process of chymification may be modified by deranging the innervation of the stomach either by administering opium, cutting the pneumogastric nerves, or producing a strong mental emotion. In these various cases, the digestive powers are not so much increased or diminished, as perverted from their natural condition. Certain cases of dyspepsia seem likewise to result from this modification of

the nervous influence. Against these, antiphlogistics and tonics are equally unsuccessful, and the reason is evident ; for the indication of cure is neither to weaken nor to excite the stomach, but to modify its action.

THIRD CLASS.

Modifications of the Phenomena of Secretion and Excretion.

We have here to study the state of the alimentary canal, 1. in the different kinds of vomiting ; 2. in the various kinds of diarrhœa ; and, 3. in cholera morbus, in which disease there are evacuations both upwards and downwards.

Most of the anatomical lesions already described as occurring in the stomach appear after death, without there having been any vomiting during life ; but at the same time there is not one of these lesions of which it may not be a symptom.

The causes of vomiting may reside either in the alimentary canal itself, or in some other part of the body.

In the first place, we find vomiting produced by all possible degrees of irritation of the gastric mucous membrane, which cause the patient to throw up either his food and drink, or else the bile that had previously been attracted by the irri-

tation into the stomach; in other cases the matter vomited consists of blood exuded by the irritated mucous membrane, or of mucus secreted in superabundant quantity ; which last, by accumulating, becomes a kind of foreign body, and produces by its presence a secondary irritation more considerable than that to which it owed its existence.   Many persons discharge from their stomachs every morning a certain quantity of mucus secreted at night ; is this daily vomiting, as has been lately maintained by M. René Prus,* the cause of certain cases of hypertrophy of the muscular coat of the stomach, that are taken for cancerous degenerations of that viscus ?   And do we, by stopping the vomiting, destroy the efficient cause of the hypertrophy, and prevent its occurrence ?   Such is the opinion of M. Prus, and he recommends opium for the purpose of putting a stop to the unusual secretion of the mucous membrane of the stomach, or *gastrorrhœa*, as it may fairly be termed.†

The most common effect of the introduction of an irritating poison into the stomach is to

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* Op. cit.

† I lately tried the method of M. Prus, upon a patient at La Charité, who had for a long time been affected with frequent vomitings of a transparent fluid resembling a strong solution of gum arabic.   I gave him, for about a month, from one to six grains of the watery extract of opium daily, which stopped the vomitings, and restored the functions of the stomach, though the ordinary effect of the medicine is to derange the digestive powers.

produce vomiting, which continues long after the poison has been thrown up ; and yet in the different varieties of fever, which M. Broussais considers as so many cases of acute gastro-enteritis, this symptom is observed but very seldom.

Other causes, which produce vomiting more frequently than irritation itself, are the various mechanical obstacles to the free passage of the contents of the alimentary canal situated either in the stomach near its orifices, or in some other part of the canal. These obstacles may either be formed suddenly, as by swallowing a foreign body, and by various kinds of internal and external strangulation ; or gradually, by the thickening of the parietes of the canal, by the accumulation of fæcal matter, or by the formation of calculous concretions, &c.

Irritation of the serous coat of the stomach is often a cause of vomiting, independently of any alteration in the mucous membrane itself. Indeed nothing is more common than to find it white and healthy in persons dying of acute peritonitis, who had been continually vomiting to the last moment of their lives.

The causes of vomiting that do not exist in the alimentary canal, must be sought for specially in the nervous centres. That a modification of the nervous system is sufficient to produce attempts at vomiting, without the stomach

being at all concerned, is a fact that cannot be doubted after the experiments of M. Majendie. This physiologist ascertained that if we remove the stomach of an animal, substitute in its place a pig's bladder, and then introduce tartar emetic into the veins, we soon observe the animal becoming sick, attempting to vomit, and, if the bladder has been properly placed, absolutely vomiting.

The vomitings owing to a modification of the nervous influence, are of many kinds.   Some are produced by the action of that conservative instinct that tends to repel every thing that might hurt the system : thus, the mere sight of disgusting objects is sufficient to cause sickness, and sometimes even vomiting.   Another example of vomiting produced in this way is to be found in the retching caused by sea sickness, by the tickling of the uvula, and by the arrival of the fecundated ovum into the cavity of the uterus. Is it not also the nervous influence that is the primary source of the copious vomitings which often occur in nephritis ? Lastly, in diseases of the brain, one of the most striking symptoms observed is vomiting, even when the stomach is found after death in a perfectly sound state. Such vomitings as those, that do not leave any trace of lesion in the stomach, frequently mark the commencement of acute hydrocephalus, con-

tinue during its whole course, and end only with life.

I think we may conclude from these facts that, in the present state of the science, the expression *nervous vomiting* deserves to be retained, as signifying a real morbid state, in which the gastric symptoms that occur have their source not in the stomach itself, which is not materially altered, but in the brain, whose texture or action is decidedly modified. One of the most striking instances of these nervous vomitings is that recorded by M. Louyer Villermay : the subject was a woman, who, in consequence of a disappointment in love, was attacked alternately with globus hystericus, dyspnœa, and palpitation ; she uttered involuntary cries, and at last was seized with vomitings, which were treated in vain by the antiphlogistic method *(diet, emollient drinks, leeching.)* She was at last cured by the *vinum absinthii*, and the first food she digested was hard boiled eggs and salad.

The various intestinal fluxes known by the names of dysentery, diarrhœa, and lientery, are not constantly connected with any peculiar state of the alimentary canal.

It is true that, in the greater number of cases, we find in the intestines of persons who have had any kind of looseness, various altera-

tions, of which the primary cause and common connecting link is a process of irritation, past or present. These alterations exist most frequently in the great intestine, of which they sometimes occupy the whole, and sometimes only a part. There are some cases where the cæcum, and others, where the rectum alone is diseased. The small intestine may continue sound through its whole extent ; and one is sometimes struck with the abruptness with which the morbid state commences immediately below the ileo-cæcal valve. In other cases, on the contrary, there is no sign of any lesion to be found in the great intestine, and the end of the ileum is the only part diseased. The most common case is that in which the inferior extremity of the ileum and a more or less extensive portion of the great intestine are simultaneously affected.

These alterations, which have been all described already, from simple injection to ulceration and perfect softening, bear no constant proportion, either to the duration, or the symptoms of the disease. Thus, in several persons who have had a diarrhœa for the same space of time, from eighteen months to two years, for instance, and in whom the disorder has been attended with the same series of phenomena, local and general, there may be found in one a simple red or brown hyperæmia, without any

other alteration ; in another, a red softening of the mucous membrane ; in a third, a white softening of the same ; in a fourth, induration with various shades of colouring ; in a fifth, an unusual development of the follicles, without any other lesion ; in a sixth, ulcers of various sizes, and in various numbers ; and lastly, in a seventh, some one or other of the above-mentioned alterations of the mucous membrane, together with various morbid states of the subjacent tunics, such as thickening, serous infiltration, &c. As to the symptoms, there is not one that announces with certainty that the intestine is affected with one particular lesion rather than another. Thus we find the same alterations where there has been a serous and bilious diarrhœa, as where there has been dysentery. There is not unfrequently complete absence of fever and of pain in those cases where the intestine is crowded with ulcers, aud the mucous membrane is greatly thickened, and of a red, brown, or black colour.

Does dissection discover, in the bodies of all who die while affected with intestinal flux, some one of the alterations just mentioned ? This has been asserted, but the assertion is not supported by facts. The researches of modern anatomists have clearly proved, that there are certain cases in which dissection cannot disco-

ver any appreciable alteration either in the co-
lour, thickness, or consistence of the intestinal
parietes, or the appearance of the follicles, &c.
In some of these cases the diarrhœa commenced
only a few days before death, and in others had
been of a long standing. Here, then, is another
case where the appearance of the alimentary
canal after death does not lead to any certain
knowledge of the functional derangements with
which it had been affected during life.

Lastly, there are some diarrhœas that are
owing to a morbid secretion which is not formed
in the alimentary canal, but which escapes from
the body by that outlet. Thus, in certain cases
of copious bilious diarrhœa, we cannot, on dis-
section, discover any thing in the intestine but
an enormous quantity of bile, beneath which
the mucous membrane is quite free from any
alteration, being scarcely injected; while the
source of the disease is the liver, as it is also in
certain cases of constipation. We see, then,
that every unusual influx of bile into the intes-
tine is not necessarily the result of a primary
irritation of that part itself. Other organs,
again, that are near the alimentary canal, may
form an accidental communication with some
part of it, and pour into it various secretions,
natural or morbid. I saw three cases in which the
ovaries poured out pus into the rectum through

a perforation, and thus produced a constant or intermittent purulent diarrhœa.*

The disease known by the name of cholera morbus, in which abundant evacuations take place upwards and downwards at the same time, is another striking instance of the difficulty we often experience in judging solely from the appearance of organs after death, how they have been affected during life. Though the terrible symptoms that accompany this disease would appear to be connected with some very serious lesions of the intestinal canal, yet we only find on dissection a greater or less degree of vascular injection, such as is frequently found in other cases, where there had been no considerable affection of the stomach or intestines during life. I have but once seen the *post mortem* examination of the body of a person that had died of cholera morbus, and that was in a case where the disease had lasted five days. The mucous membrane of the great extremity of the stomach exhibited a fine red dotting ; but in the rest of the stomach it was hardly injected, and was of the usual consistence and colour throughout. There were a good many arborescent injections on the internal surface of the

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* A very interesting case of this description has been published by M. Dalmas, in the *Journal Hebdomadaire de Médecine*, for November, 1828.

two lower thirds of the small intestine, whose parietes had no where lost their transparency; the cæcum was of a greyish tint, and the rest of the great intestine was but slightly injected. The liver, spleen, and lungs were gorged with blood.

FOURTH CLASS.

Modifications of the Sensibility.

Severe pain seldom accompanies any of the various alterations of texture of the gastro-intestinal mucous membrane. It may be injected, softened, thickened, or deeply ulcerated, without the patients' complaining of any uneasy sensation; or, at most, they feel some griping pains on going to stool. This is the case not only in the chronic, but also in the acute state of these lesions. We may in general press the abdomen in all directions, in persons labouring under severe fever, and whose intestines are considerably ulcerated. It is only when the ulcers extend in depth, so that their bottom is composed of the peritoneal membrane, that severe pain is felt.

While the most serious alterations in the texture of the gastro-intestinal mucous membrane produce little or no pain, there are other cases in which the alimentary canal becomes

the seat of very severe pain without its texture
being at all altered ; as in the disease known
by the name of colica pictonum, or saturnine
colic.   Some writers have asserted that in cases
of this affection they found, on dissection, the
caliber of the intestines remarkably diminished ;
others, again, that the symptoms arose from in-
trosusception ; and lastly, others, that in per-
sons who had died of the disease, the intestine
was found more or less injected, and that, con-
sequently, this disease was a species of enteritis.
It is very possible that there may have been
found, in the intestines of persons who died of
saturnine colic, diminution of caliber, introsus-
ceptions, or various degrees of redness ; but all
these lesions seem to me to be merely acci-
dental, since, on the one hand, they may occur
without producing the symptoms of colica pic-
tonum, and, on the other, they are not invaria-
bly found in persons who have died of the dis-
ease.   I have related elsewhere * in detail seve-
ral of these cases in which I was not able to
discover any appreciable lesion in the alimen-
tary canal.   M. Louis has related others of the
same description.   Neither could I, in a single
case, discover any lesion of the nervous centres,
and yet there had been remarkable paralysis
in most of them.

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* *Clinique Medicale.*

It is not merely persons exposed to the influence of lead that present the various symptoms whose assemblage constitutes colica pictonum : the same symptoms are observed, 1. in persons who have been exposed to sudden and repeated variations of temperature ; as in the colic of Madrid ; 2. under the influence of causes that act primarily on the nervous system ; and, 3. without any known cause. In the two last cases, the disease gets the name of nervous colic.

During the last campaign in Spain, there were several opportunities of examining the bodies of persons that had died with all the symptoms of the colic of Madrid. Dr. Pascal* has published an account of six dissections of this kind made by himself; and the result is, that in the colic of Madrid, as in the saturnine colic, the lesions of the alimentary canal are neither serious nor constant. Thus, he found a redness of the intestine, and that but slight, in three of the cases. The brain seemed in its natural state in all; he always found the spinal cord injected ; in one case it was softer than natural for a space about two inches long. He also examined the great sympathetic, and assures us he found several of its ganglions injected, and their

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* *Memoire de M. Pascal* in the *Journal de Médecine Militaire.*

consistence somewhat altered. While praise is due to M. Pascal for his useful researches, we must wait for further observations to confirm their results.

§ II. *State of the Alimentary Canal in Fever.*

The term *fever* must have been one of the first employed in medical language. It is purely metaphorical, and was used at first merely to express some of the more prominent symptoms of the disease. When the skin felt hot, and the pulse beat with increased force or frequency, the state of the system was expressed by borrowing a term that gave some idea of the disease ; πυρεξις of the Greeks, *febris* of the Latins : and the whole practice then consisted in opposing to this burning fever, medicines called temperative, or cooling.

It was soon observed that, during the course of fever, besides the general symptoms that characterize its presence, various others often appeared that denoted an affection of some organ in particular ; this was considered one of the effects of the fever produced by its exerting its virulence chiefly on that particular part, or, as the common people still say, *fastening upon it ;* hence the terms pneumonic, pleuritic, cerebral, gastric, rheumatic fever, &c.

During this second period, the fever was still considered the cause of all the organic lesions that occurred during its course ; but this theory was gradually modified, and many lesions which were at first considered the effects of the fever, came subsequently to be considered as its cause. When this reformation was effected, the fever was in a number of cases regarded merely as a symptom ; the names of the diseases were modified, the terms pneumonia, pleurisy, &c., being substituted for those of pneumonic, pleuritic fevers, &c. ; and the term *fever* was restricted to certain morbid states, characterized by frequency of the pulse, heat of the skin, and a general derangement of the functions, *without any evident local origin.* It was supposed that in such cases the cause of the fever resided in itself, and hence Galen termed it *essential fever.* However, the different morbid states thus denominated were far from being similar ; and it was therefore necessary to admit several kinds of essential fevers, which received various names, taken sometimes from their supposed causes, (such as nervous fever, bilious, mucous, putrid, milk, camp, hospital, gaol fever, &c.,) and sometimes from their symptoms, (such as inflammatory, malignant, putrid, typhoid, petechial, pestilential, yellow, hectic, &c.) The mention of these various names is sufficient to shew that

the names given to the so called essential fevers had no fixed basis, and varied continually with the theories of the day.

In default of some organic alteration that could be regarded as the local origin of fever, its proximate cause was at one time supposed to be a morbific matter which was to be eliminated by the fever; at another, an obstruction, against which the heart reacted; sometimes it was attributed to spasm of the nerves, sometimes to a spontaneous alteration of the blood, and, lastly, to a modification of the general excitability, whether consisting simply in its augmentation, or in its diminution subsequent to its augmentation.

Even to the present day many authors have continued to apply the term fever to many of the inflammations of organs; and it is by that name they are still described in the *Traité de Medicine Practique* of Hildenbrand. Pinel, in his *Nosographie Philosophique*, established a perfectly distinct class of these inflammations, in which fever was only considered one of the symptoms, and retained the denomination essential fevers, to signify certain general morbid states in which there is nothing to be observed but a quickening of the pulse, heat of the skin, and general derangement of the functions. He agreed with Galen in considering this morbid

state as *essential,* that is to say, capable of exist-
ing independently of any local lesion. How-
ever, strange to tell, while Pinel thus admitted
the existence of essential fevers in his Nosology,
he attributed them to local causes in his list of
synonyms. Thus, he placed the inflammatory
fever of authors in the apparatus of circulation,
by calling it *angeio-tenic* fever ; he allowed that
in bilious fever the gastro-intestinal mucous
membrane is particularly affected, since he
called it *meningo-gastric* fever ; he attributed
mucous fever to the intestinal follicles, by
calling it *adeno-meningean ;* and, lastly, he estab-
lished positively that ataxic fever is seated in
the nervous system. As to the term adynamic
fever, he considered it merely the expression of
a symptom. We must observe that in the
whole of this classification he attributes no part
to the fluids, but shows himself an exclusive
solidist.

Pinel's classification of essential fevers was
necessarily temporary : it is evidently the pro-
duct of the constantly increasing tendency
among physicians, from the time of Galen, to
the *localization* of fevers. In fact, one of the
problems whose solution has most constantly
occupied them, may be thus stated : given an
assemblage of symptoms, to find their cause in
the alterations of some solid or fluid. In Pinel's

classification, or rather in his list of synonyms of essential fevers, all is not new; he was not the first that appreciated the great influence of the alimentary canal in the production of many of them.   Most of the authors who had previously devoted their attention to pathological anatomy, had pointed out the alterations found in the canal in such cases, much better than he did; and in this respect he is to blame for not having sufficiently profited by the labours of his predecessors.   Do we not find in Bonetus: *Anatome eorum qui febre maligna extincti sunt, docet ventriculum cum intestinis inflammari;* and in Bartholinus: *In omni febre acuta imminet ventriculi inflammatio?*   Again, Sydenham has repeated in several parts of his works, that the intestines become ulcerated in continued fevers; and Rœderer and Wagler, in their history of the mucous fever of Gottingen, have given an admirable description of the alterations of the follicles, and the ulcers, &c., that were found on opening the bodies of those that sunk under it.

None of these authors, however, has maintained positively that the lesions they discovered in the alimentary canal were the cause of the essential fevers; some regarding them as an effect of the fever, or as a complication, and others allowing them only a part in the production of certain symptoms.   Properly speaking,

this is all that Pinel has done too ; but still, in his writings, as in those of his predecessors, there is a constant tendency to the localization of fevers. Such was the state of science when M. Broussais came to effect a happy change in this department of pathology. The ideas of this eminent Pathologist are now so widely disseminated, and have been so generally adopted, that it would be quite useless to describe them here : to examine them, and decide upon their merits, is all that we shall need to do.

To seek, in the alteration of one or more parts of the body, the seat and the cause of the fevers called essential ; to consider them as merely the symptoms of a local affection more or less manifest ; and to direct the treatment against that affection, and not against the fever itself, which is merely an effect, are parts of the doctrine of M. Broussais which have already produced a most extensive and important revolution in medical science. These tenets, however, form but a part of his doctrine : he has also attempted to specify the lesion which alone, in his opinion, can give rise to the various symptoms that characterize essential fevers, and he maintains that all such fevers are the result of gastro-intestinal irritation. Here he has failed; and while I agree with him that every kind of fever may be attributed to a local source, I think

that the localization should not be at all so confined as he has made it.   On this head, the following propositions appear to me to give a pretty accurate idea of the present state of our knowledge with respect to the seat and nature of fever.

There is no essential fever, so called, which may not be referred to the alteration either of some solid or of the blood, as its cause.   These essential fevers, then, are not general diseases, inasmuch as they have always a local origin ; but they may be considered general in this sense, that, being sometimes seated in the nervous centres, or in the blood, they produce a disease all over the body, wherever the blood and nerves are distributed, or, in other words, a general disease.

With respect to their local origin, fevers may be divided into three classes ; the first consisting of such as arise from a primary alteration of the nervous centres ; the second, of those arising from the lesion of a solid ; and the third, of those arising from a modification of the blood.

The fevers belonging to the first class are distinguished by that assemblage of symptoms which M. Pinel has assigned to adynamic and ataxic fever, especially the latter.   The former, however, more frequently occurs when the dis-

order of the nervous centres is subsequent to an affection of the alimentary canal, or some other part. Although the symptoms of those fevers plainly point out their seat during life, dissection sometimes discovers no more alteration in the nervous centres than in the other organs. In my opinion, this absence of alteration does not affect the determination of the seat of the disease ; that having been too clearly indicated by the derangement of the functions to be mistaken. Will any one assert that epilepsy or tetanus is a general disease, because he cannot discover any lesion in the bodies of persons who have died of either ?

Fevers of the second class depend on the primary alteration of a solid ; this alteration may be, 1. in the quantity of blood it receives ; 2. in its texture ; or, 3. in its functions only. The solid primarily affected is certainly in a large proportion of cases the alimentary canal, but it may also be the skin, lungs, liver, kidneys, heart, vessels, uterus, ear, prostate, &c. I have mentioned these different parts, because I am in possession of facts that prove that the alteration of any one of them, without any concomitant lesion of the alimentary canal, is capable of giving rise to the symptoms that constitute the different essential fevers. The tongue, in some of those cases I allude to, was red, in

others thickly coated, and in others dry and black, and yet on dissection there was no lesion discovered either in the stomach or intestines.

In these various cases, we are far from being always able to establish a constant proportion between the intensity of the lesion, and the nature of the symptoms that constitute the fever ; as they depend much less on the severity of the local lesion, than on the state of the innervation and sanguification that happens to exist in the individual in whom the lesion occurs. In fact, on this circumstance it depends whether the slightest lesion may not occasion a most serious ataxic or adynamic fever ; and a much more severe one produce only inconsiderable symptoms.

Adynamic fever, which is so often occasioned by these various lesions, is a complex term comprehending several morbid states differing greatly with respect to their nature and proper treatment. It is often merely the result of a considerable oppression of the vital powers, produced by a local lesion. But, frequently also, when the lesion occurs, the nervous centres have scarcely reacted before they fall into a real state of collapse, and in this case the adynamic condition is genuine ; the nervous influence by which every organ lives has really lost its energy ; and throughout the whole body life is

less active, and the resistence to the return of the organized being to the dominion of the laws of physics is less strong ; we have here a genuine adynamic state produced by an increase of vitality in some part of the body. In such cases it may happen that along with the signs of prostration of strength we observe some symptoms of cerebral excitement ; but such symptoms are only factitious, as the adynamic state is in other cases. We must therefore beware of supposing that subsultus tendinum, convulsions, and delirium, are always signs of increase of cerebral life : they are so far from being necessarily so, that they sometimes occur after abundant hæmorrhages.

Lastly, the third class of fevers appears to be more particularly connected with alterations of the blood. On this head, I can but refer to what I have already said in the first volume, when treating of the diseases that may arise from that source. I shall content myself at present with repeating that the fever termed *inflammatory*, seems to me often to arise from no other source than the blood's being too rich in fibrine ; in like manner an impoverished state of the blood, whether accidental or natural, is often connected with mucous fevers, and with those characterized by a sudden sinking of the vital powers : the blood's not being sufficiently depurated is certainly the cause of the

fever termed *urinous,* and probably that of certain bilious fevers also ; lastly, the source and primary seat of typhus fevers, properly so called, is proved to be in the blood, inasmuch as they are caused by the introduction of deleterious substances, such as animal or vegetable effluvia, into that fluid.

§ III. *State of the Alimentary Canal in the Diseases of the various Organs.*

It has long been known that the alimentary canal is one of the organs that most readily influence the diseases that may be situated in other organs ; as also that its affections may be the source of a great many functional derangements of different organs.

In every ten cases of acute disease not arising from the alimentary canal, there are about eight in which is observed a greater or less derangement in the texture or functions of that part.

In chronic diseases, whatever be their nature, it is very seldom indeed that the alimentary canal does not undergo some alteration. This is sometimes permanent, and is then chronic, like the disease with which it is complicated ; in other cases it is only temporary, and there may be either one, or several attacks of it. The gastro-intestinal irritation that occurs thus intermittingly may produce no effect on the pri-

mary chronic affection ; but the reverse fre-
quently happens.   There are cases, for instance,
in which, whenever the irritation of the diges-
tive passages re-appears, the chronic affection is
exasperated, and has a tendency to return to the
acute state ; there are others in which, on the
same occasion, the old affection, so far from
being exasperated, is so much amended that its
symptoms become much less apparent.   Lastly,
in many cases, whether the primary chronic
affection be unaltered, aggravated, or relieved,
the gastro-intestinal irritation produces another
effect : it acts on the innervation, and produces
in the patient exhausted by long disease that
assemblage of symptoms that characterizes the
adynamic fever of Pinel.   Under such circum-
stances, a slight irritation of the alimentary
canal is sufficient to produce a great and sudden
prostration of strength.   Many persons affected
with a chronic disease that has long been un-
dermining the constitution, sink thus under an
adynamic fever arising from a trifling conges-
tion in the alimentary canal.   The danger of
such a hyperæmia is not so much in proportion
to its intensity, as to the diathesis of the patient
at the time it occurs.

There are certain cases of hyperæmia of the
mucous membrane of the air passages that are
accompanied by a similar affection of the mu-

cous membrane of the alimentary canal, which, being spread over a great surface, is but slight in any one point. The diseases known by the names of *inflammatory*, *mucous*, and *catarrhal fevers*, are often merely an effect of this general congestion of the two mucous membranes.

Whenever either of these membranes is the seat of chronic irritation, it is very seldom that the other does not also become affected. The alimentary canal is so habitually diseased in persons affected with tuberculous bronchitis, that such disease is in a manner one of the elements of phthisis, and almost makes a con-stituent part of it. In about four-fifths of the phthisical patients that die at an advanced pe-riod of the complaint, the intestines are found greatly diseased ; the lesion most frequently observed is ulceration, the ulcers being gene-rally situated at the end of the small intestine, where they sometimes, though not always, at-tack Peyer's glands, and in the cæcum. They are very variable in number, form, and size, and are most commonly formed without any pain, producing merely a more or less abundant diarrhœa. From the very commencement of phthisis it is not unusual to observe slight signs of intestinal irritation ; there are often alterna-tions of constipation and of diarrhœa, which last gradually becomes permanent, like the lesion that produces it.

The stomach in consumptive patients is also affected, but the alterations it presents are of another description : there are usually neither ulcers nor tubercles found in it ; but its mucous membrane is very often softened, and the whole of its parietes are frequently attenuated.*

What is the cause of the dyspepsia or of the pains in the stomach experienced by many women affected with leucorrhea ? Do they suffer merely from simple gastric irritation ? Is the morbid modification that takes place in their stomach, of the same nature as that which the utero-vaginal mucous membrane has undergone? If the alteration of secretion that takes place in the latter is often removed only by treatment that is any thing but antiphlogistic, are we to employ the same treatment to relieve the stomach ? There is still some light wanting on this subject : however, as it is always advantageous to the cause of science to publish facts for the accuracy of which we can answer, I shall state briefly the following case. A woman was admitted at *La Charité* with a leucorrhœa of long standing, difficulty of digestion, and a pain in the region of the stomach. I prescribed

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* The different ways in which the stomach and intestines may be affected in phthisis pulmonalis exert a great influence over the symptoms and progress of the disease. On this head, I could but repeat here what I have already said in my *Clinique Medicale*, to which I refer the reader.

leeches to the epigastrium, without effect ; and opiates were found equally unsuccessful. I then tried pills of extract of bark and iron filings, whereupon the pain in the epigastrium diminished, and digestion was restored.

Cutaneous affections are accompanied as frequently as those of the various mucous membranes by a diseased state of the *primæ viæ*. In persons that die of extensive burns, the alimentary canal is generally found of an intensely red colour. Every one knows that in many cases of erysipelas, the stomach is affected at the same time ; and it is also known that this affection, which is by many physicians considered to be owing to the presence of bile in the stomach, has been often relieved by emetics. It has been said that, by employing such medicines, the gastric symptoms are removed, the erysipelas is rendered milder, and its extension or renewal prevented. Theoretically, I do not see any absurdity in the supposition that the presence of an unusual quantity of bile or mucus in the stomach may produce erysipelas. It is well known that muscles, when eaten, sometimes produce nettlerash. Judging from experience, what may be said on the practice of administering emetics in erysipelas is this : 1. they are injurious when the tongue is red, and the thirst great, &c. ; 2. they have no effect

either way in many cases where there are no evident signs of gastric affection ; 3. they are really useful where the patient has a bitter taste in his mouth, the tongue covered with a thick white or yellowish coat, without any redness beneath or around it, fetid eructations, nausea, &c. ; in such cases, I have known the employment of emetics remove these symptoms, and the erysipelas have a favourable and speedy termination. Whatever theory we adopt, we must admit these facts.

At the commencement of the febrile exanthemata, there is almost constantly a congestion of one of the mucous membranes; and it is not one of the least remarkable circumstances in the history of these diseases, that, in each of them, the same portion of membrane is always affected : in scarlatina, it is the mucous membrane of the pharynx ; in the measles, that of the air passages ; and in small pox, that of the stomach. Before the eruption of this last disease, the gastric membrane generally presents only a slight irritation, which diminishes rather than increases when once the eruption begins to appear. But, in some cases, this precursory irritation is very severe, and either continues after the commencement of the eruption, which then comes out very badly, or diminishes or

even ceases altogether, as soon as the eruption begins to appear.

The gastro-intestinal irritation, though slight at the commencement, may become much more intense during the course of the disease ; and in many cases where the small-pox is termed putrid, malignant, adynamic, &c., it is merely complicated with a more or less severe gastro-enteritis, which, on the one hand, has modified the eruption, and on the other, has reacted on the nervous centres. When the disease proves fatal, there are found in the alimentray canal the various alterations already described, from hyperæmia to ulceration. Are there also found in it pustules similar to those that cover the skin ? Since they are observed very distinctly on the mucous membrane of the cheeks, there is no reason why they should not also occur on the portion of the membrane situated lower down. But, though in theory the existence of variolous pustules in the intestine is admissible, they have never yet been seen there. The mucous follicles, more developed than ordinary, have often been taken for them ; such a mistake is particularly easy in children, in whom these follicles are often very large.

The chronic exanthemata are attended with a state of irritation of the digestive passages much less frequently than has been asserted.

I require no other proof of this than the ease with which persons affected with various chronic affections of the skin support, at the hospital *Saint Louis*, under the care of M. Biett, the most irritating medicines, which that able practitioner knows how to employ so happily.

If we direct our attention to certain organs that may be regarded as appended to the alimentary canal, we shall find that they can hardly be diseased without its either having been so previously, or subsequently becoming so. In how many cases, for instance, are the affections of the liver connected with a morbid state of the intestines. It is the same with the mesenteric ganglions, and almost every time that they are found diseased in the dead body, we either find traces of intestinal irritation also, or else learn from the symptoms, that such irritation had existed at a period more or less remote from the time of the examination.

One of the most important services which M. Broussais has rendered to medicine, was the proving that, in many cases where, from the functional derangements, one would suppose the nervous centres were alone affected, the origin of the disease is really to be found in an irritation of the alimentary canal. This is true of all ages, particularly of infancy. In children it frequently happens that, after coma, convulsions,

&c., there is no morbid appearance to be discovered in the brain, while the alimentary canal is evidently diseased.

A great many functional derangements of the nervous centres have been referred to irritation of the digestive tube, because the intestines have frequently been found diseased in cases where such derangements had existed. Thus, it has been asserted that tetanus, epilepsy, chorea, apoplexy, and alienation of mind, result from gastro-enteritis. In my opinion, there is not a nervous disorder that may not be developed in consequence of an irritation of the alimentary canal, as well as of any other part; but then a previous disposition to it is requisite.

On the other hand, the nervous centres, when primarily affected, often exercise as great an influence over the alimentary canal as it does over them; but the influence is not always of the same kind: sometimes, for instance, irritation of the brain produces in the stomach a hyperæmia demonstrable by dissection, and sometimes an excitement indicated by the derangement of its functions, but not discoverable by the anatomist. Thus it often happens, as we have already remarked, that we cannot discover any lesion in the stomach of persons who have been affected with copious vomitings in consequence of acute hydrocephalus. Lastly,

in other cases, diseases of the brain affect the alimentary canal with a kind of torpor, so that emetics and purgatives do not produce any effect.

SECTION II.

DISEASES OF THE PORTION OF THE ALIMENTARY CANAL ABOVE THE DIAPHRAGM.

THE infinitely varied forms assumed by these alterations have all been included by modern anatomists under the three general terms, *stomatitis*, *pharyngitis*, and *œsophagitis ;* but these denominations are often insufficient or inaccurate. It is true that all these alterations have, as a common element, a sanguineous congestion preceding, or, at least, accompanying them ; but, in many cases this is neither their sole nor their chief cause, and in none can its various degrees of intensity serve to explain the nature or degree of the alterations produced. Thus, it would be committing a strange mistake to suppose that ulcers of the mouth and pharynx, the false membranes that line their surface, and gangrene of the same parts, are connected with an intense congestion : they are so far from being so, that the local signs of irritation that precede them, and the sympathetic functional derangements they produce, are often much

less marked than those that accompany the
most simple erythema of the mucous membrane
of the mouth or pharynx. But, even though
the numerous lesions included under the com-
mon name of *stomatitis* or *pharyngitis* appear
frequently to be idiopathic, and to depend solely
on a local process of irritation, either sponta-
neous or produced by the application of some
stimulating substances, there are other cases in
which such lesions are merely some of the secon-
dary symptoms of a disease affecting simulta-
neously other solids, or even the whole mass of
the blood. Thus, in persons that have long been
breathing an impure, damp air, and living on bad
or not sufficiently nutritive food, and in whom we
have every reason to think that the blood is more
or less altered, we often find the mucous mem-
brane of the cheeks gorged with a thin blood that
oozes out through the parietes of its vessels ; we
find it softening, ulcerating, and becoming gan-
grenous. In such cases it sometimes happens
that, without any pain or antecedent hyperæmia,
a grey or black spot appears in some part of the
mouth, extends rapidly, and in a few hours the
whole of the mucous membrane of the cheeks is
reduced to a putrid mass. Towards the end of
certain chronic diseases, or during the course of
an acute disease in persons of a feeble constitu-
tion, and habitually deficient in blood, it is not

uncommon to see the internal surface of the
mouth coated with a whitish, pulpy layer, which
increases as the vital powers diminish, and dis-
appears if they return.   Even admitting that in
such cases this morbid secretion results sympa-
thetically from gastro-intestinal irritation, we
must acknowledge that it is a peculiar effect of
it ; since every degree of such irritation may oc-
cur without the secretion being observed, and,
on the other hand, be the degree what it may,
the secretion appears under particular condi-
tions of innervation and sanguification. What-
ever be the way in which we suppose the sy-
phylitic virus to exist, still it is true that, in a
longer or shorter period after impure coition,
we but too frequently observe the different por-
tions of the stomato-pharyngean mucous mem-
brane eaten up by ulcers ; and, in this case,
it is very evident that they are only one of the
symptoms that indicate the general alteration of
nutrition, just as it may at the same time be in-
dicated by various lesions of the skin, osseous
system, &c.   Again, introduce mercury into the
system, and you will behold effects more or less
resembling those already mentioned.   In such
cases we observe, as a constant and primary
lesion, an alteration of the blood, which becomes
like that of scorbutic persons ; and, as consecu-
tive lesions, various alterations of nutrition,

amongst others, lesions of the mouth analogous to those observed in scurvy : and it is a remarkable fact, that the slightest irritation accidentally offered to the mucous membrane of the cheeks, which under any other circumstances would only produce a trifling erythema, is in these cases sufficient to cause the most serious derangement in that membrane. Thus, in certain individuals, we observe a tubercle or a cancer occasioned by the slightest inflammation.

From those considerations we may infer that many of the diseases of the mouth are only accidental or necessary manifestations of a morbid state originating elsewhere ; and consequently, that, in this case, as in many others, the disease is not confined to that part where organic lesion can be detected ; that there is often a great difference between discovering the true nature of the disease, and being aware of the existence of such lesion ; and, lastly, that it would in many instances be either useless or dangerous to attempt to combat the lesion by purely local treatment.

CHAPTER I.

Accidental Lesions of that Portion of the Alimentary Canal situated above the Diaphragm.

ARTICLE I.

LESIONS OF THE MOUTH AND PHARYNX.

I HAVE nothing particular to say concerning the various degrees of hyperæmia, softening, and induration, that may be presented by the stomato-pharyngean mucous membrane ; as they resemble those I have already described in detail, when treating of the stomach and intestines.   This membrane, however, presents some other alterations that are peculiar to itself, which must consequently be here described. Of this nature, particularly, is the kind of affection lately described by M. Bretonneau under the name of *diphtheritis*, which is merely an acute hyperæmia of the mucous membrane of the mouth and pharynx, followed by a membraniform exudation that announces the peculiar nature of the disease, since it is certain, that this remarkable morbid production cannot be accounted for either by the intensity or the duration of the sanguineous congestion that pre-

cedes and accompanies it. In this, as in a
thousand other cases, hyperæmia is one of the
elements of the disease; but it is not its sole
constituent : accordingly, as we learn from M.
Bretonneau, diphtheritis does not yield to blood-
letting, while, notwithstanding the train of in-
flammatory symptoms that accompany it, its
progress is arrested by stimulating substances,
such as hydrochloric acid, alum, and chloride of
lime. Now, how do those agents act; is it by
subduing irritation? Surely not ; for their ef-
fect would rather be to increase it. But per-
haps it will be said that one irritation is substi-
tuted for another : the assertion is merely hypo-
thetical ; and even granting it to be true, there
should be as frequently, or even more frequently,
exasperation as amendment of the disease ;
which is not the case. We must acknowledge,
then, that by this more or less stimulating treat-
ment we modify that unknown disposition by
virtue of which the morbid secretion takes place ;
and the hyperæmia is a secondary symptom
produced by the same cause that gives rise to
the membraniform exudation.

However, the hyperæmia, though secondary
with respect to causality, is the first symptom
that appears in diphtheritis ; as, in a gland, the
afflux of blood to the part precedes the secretion
of the fluid, though the particular nature of the

secreted fluid can in no wise be accounted for
by the different degrees of abundance of that
afflux.   The first symptom we observe in dipth-
theritis is a number of red dots or streaks scat-
tered over the surface of the mucous membrane,
which does not in general present any remark-
able degree of tumefaction.   Sometimes, how-
ever, from the very outset of the disease, the
surrounding cellular tissue is congested, and the
submaxillary lymphatic ganglions are consider-
ably swelled.   The red appearance of the mem-
brane is, after a longer or shorter interval, suc-
ceeded by a set of white spots, which are at first
isolated, and seem to exist chiefly on the folli-
cles, but afterwards multiply, enlarge, touch,
and at last run together so as to form a uni-
form layer of greater or less extent : sometimes
there are several patches ; and sometimes there
is only one, which covers a vast space, and is
continually extending itself.   The thickness of
this layer is variable ; it is occasionally thin
enough to be in some degree transparent.   One
of its surfaces is free ; the other, which adheres
to the mucous membrane, presents a great ma-
ny processes that dip into the mucous follicles.
Its colour is generally white, but it is sometimes
greyish and soiled by the blood exhaled by the
mucous membrane, which gives it an ashy tint,
that, together with the extreme fetor of the

secretion, has often caused such patches to be taken for sloughs of the mucous membrane. At other times, patches of small extent, and lying lower than the surrounding tumid mucous membrane, have been mistaken for ulcers.

From the mouth and pharynx, these membraniform patches may extend to the air passages, œsophagus, or nasal fossæ; they may also occupy simultaneously the external auditory duct, and the temporal surface of the concha; and, lastly, as if wherever a process of irritation was produced it had a tendency to terminate in a similar secretion, we observe those parts of the body that have been blistered, and in general all denuded surfaces, covered with a pseudo-membranous layer more or less analogous to that in the interior of the mouth and pharynx.

With respect to its consistence, the layer presents several varieties, being pulpy, caseiform, or like lard. It may be situated beneath the epithelium, or lie naked on the mucous membrane. When detached, it may or may not be renewed several times. All those varieties should, in my opinion, be considered merely as different shades of the same disease.

The tissues subjacent to the stomato-pharyngean mucous membrane do not escape its

disorders. For instance, we often observe the
cellular tissue that enters into the composition
of the parietes of the mouth or pharynx, be-
coming affected. In the first place, it not un-
frequently becomes the seat of a considerable
afflux of blood, causing a sudden tumefaction of
the part; as is exemplified in the cheeks in
those diseases termed *defluxions*. It is also by a
similar accumulation of blood in its cellular tis-
sue that the tongue sometimes acquires, in a
very short space of time, such an enormous
bulk, as to stop up the posterior part of the
mouth, considerably obstruct the passage of the
air, and project beyond the lips. This tume-
faction of the tongue, which may be compli-
cated with hæmorrhage from its surface, is
evidently the result of congestion, as it is rea-
dily put down by deep incisions. It sometimes
occurs intermittingly. In place of blood, it is
sometimes serum that infiltrates the cellular
tissues. Such serous congestions have been
observed in the tongue, but are still more fre-
quently seen in the uvula, which then acquires
a kind of transparency, increases singularly in
size, and interferes with the deglutition. This
œdema of the uvula may be idiopathic, connect-
ed with some varieties of cynanche, or attend-
ant on induration of the tonsils. Pus may also
exist in this cellular tissue, either generally dif-

fused, or in the form of an abscess; it is most frequently found in the substance of the cheeks, gums, and tonsils, and sometimes occurs also in the substance of the tongue.

This same cellular tissue, when it has undergone a chronic alteration in its nutrition, becomes thickened, indurated, and at the same time infiltrated with an albuminous fluid that concretes, and unites with it; in this way the lesion termed *scirrhous degeneration*, is produced. At the same time that the cellular tissue becomes thus developed and indurated, the surrounding tissues (by virtue of a law I have elsewhere proved) often have a tendency to atrophy, becoming less and less distinct, and at last disappearing altogether, leaving nothing behind them but a hard homogeneous mass of a white or greyish colour. In a person whose disease was termed scirrhus of the tongue, that organ, which was increased in size, and remarkably hard, presented merely a whitish tissue, resembling the indurated cellular tissue around old cutaneous ulcers, and containing some scattered vestiges of muscular fasciculi, which were thin, colourless, compressed, and almost effaced.

Of the numerous follicles that open on the surface of the stomato-pharyngean mucous membrane, those whose assemblage forms the tonsils are subject to several morbid alterations that

deserve a particular description. The seat of
these alterations is sometimes in the cellular
tissue situated between the follicles, which may
either be simply congested, secrete pus, or be-
come indurated and enlarged, thus producing
the so called *scirrhous state of the tonsils.* At
other times it is the follicles themselves, as well
as the lacunæ into which they open, that are
altered either in the texture of their parietes,
or in the fluid contained in their cavities.
Their parietes, like those of every other fol-
licle, are found, according to the case, either in
a state of simple hyperæmia, or of hypertrophy,
induration, or softening. The fluid naturally
secreted by them may be modified in its quality,
so as to become either pus, or a concrete friable
substance like tubercle, or one still more solid,
of sufficient consistence to be termed a *calculous
concretion,* and varying in size from the bulk of
a grain of millet to that of a kidney bean.
These various morbid secretions seem to be
contained, sometimes in a single lacuna consi-
derably enlarged, and sometimes in a cavity
formed by the accidental union of several.
These facts are not merely interesting from the
situation of the parts affected, but also from the
light they throw on the nature of the alterations
of texture of other portions of the mucous mem-
branes, in which accidental cavities containing

pus, tuberculous matter, or calculous concretions, seem likewise to be merely follicles altered in the structure of their parietes, and in the qualities of their secretion.

Hypertrophy of the tonsils may exist unattended by induration: it is frequently accidental, but is sometimes congenital. It generally becomes a permanent cause of irritation to the neighbouring mucous membrane, thus producing frequent sore throats. Here, then, is an instance of the developement of a tissue beneath a mucous membrane being a cause instead of an effect of an acute or chronic irritation of that membrane. The overgrown tissue here acts in a manner as a foreign body. It is, perhaps, also worthy of remark, that in many persons whose tonsils thus present an excess of developement (a disposition known to be hereditary) we likewise observe a bad conformation of the thorax, and other characters of the scrofulous diathesis: so true is it that in this case, as in many others, a slight and circumscribed modification of nutrition, affecting an insignificant organ, depends on the most serious modifications in the whole of the nutritive process.*

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* A great many diseases undoubtedly originate in purely local lesions; but the severity of those lesions, the symptoms to which they give rise, their various terminations, and even the modifications produced in them by the treatment employed, all depend on the state of the *whole system* at the time.

Gangrene of the mouth and pharynx has been long considered a common affection ; but recent researches have shown the inaccuracy of such an opinion. It is beyond all doubt that the greater number of cases of gangrene of those parts described by old authors should be referred to certain varieties of stomatitis or pharyngitis, attended with formation of greyish false membranes. However, we must not fall into an opposite error, and deny the existence of such gangrene altogether. It is quite certain that it has more than once been known to succeed an acute irritation of the stomato-pharyngean mucous membrane. In other cases, the gangrene seems to be almost the primary affection ; without any of the usual premonitory symptoms, there appear in one or more parts of the mouth or pharynx, spots of a brownish red, which soon become black, extend more or less rapidly, and change into sloughs of variable size and depth. This gangrenous affection of the mouth has been more frequently observed in children than in adults. Even among children, it is scarcely ever met with except in those of the poorer classes, that have been dwelling in damp, dark habitations, and living on unwholesome or not sufficiently nutritive food ; or in such as have a highly scrofulous constitution, or shew symptoms of scurvy. This

affection sometimes attacks individuals that are free from any acute disease, and sometimes, those that are labouring under gastro-enteritis, or some cutaneous eruption, such as small-pox, measles, or scarlatina. It may attack the mucous membrane only, which it then destroys to a greater or less extent, extend its ravages to the subjacent tissues, or even involve the whole of the soft parts that enter into the composition of the parietes of the cheeks, and thence proceed to the periosteum and the bones. When the disease arrives thus far, the teeth already grown fall out, the roots of the second set are also destroyed, and, if the patient recover, he probably remains toothless the rest of his life. At the same time the child grows remarkably pale; its cheeks become œdematous, its whole body wastes rapidly away, the pulse becomes small and wretchedly feeble, the skin cold, and if the progress of the gangrene be not arrested, death speedily follows. Some authors see in all this train of symptoms nothing but stomatitis terminating in gangrene. But, if it be true that this gangrene occurs chiefly under certain morbid conditions of the innervation and sanguification, and if, moreover, its appearance is not preceded by any perceptible inflammatory reaction, should we not, in this case also, consider the affection of the mouth to be connected with

a morbid state that is not confined to the part where the gangrene appears ? In like manner, in those cases where the use of rye affected with ergot, as an article of food, is followed by gangrene of the inferior extremities, the cause of the gangrene is not to be found in those extremities.

Writers have described, under the name of *glossanthrax*, a variety of gangrene of the mouth affecting the tongue. It commences by the appearance, in some part of the tongue, of a vesicle filled with a bloody serum, which is at first livid, but soon becomes black, breaks, and beneath it the gangrene extends more and more, and may even involve the whole of the organ ; when the disease attains this height, symptoms of nervous prostration set in, and death speedily ensues. Glossanthrax has sometimes been met with in man, but has been chiefly observed in horses living on watery food and in damp situations. It has been ascertained that, at the same time that this affection raged among numbers of horses that were placed under the circumstances above described, others that inhabited the same country, but were not exposed to damp, and were supplied with good provender, escaped. It has also been frequently found, in horses, that the gangrene of the tongue was attended with gangrene of other organs.

Ulceration occurs as a common, but not a necessary termination of the various alterations of the mouth and pharynx that we have been considering. Sometimes its appearance is preceded by a simple hyperæmia of the mucous membrane, which subsequently becomes softened and eaten away in a circumscribed point ; sometimes it succeeds a vesicle or pustule ; and in some cases it occurs as the termination of a diphtheritic or gangrenous irritation. Ulcers in this situation present nothing worthy of remark, beyond what I have already pointed out in my description of ulcers of the infra-diaphragmatic portion of the canal.

ARTICLE II.

LESIONS OF THE ŒSOPHAGUS.

THE œsophagus much less frequently undergoes any morbid alteration than the mouth and pharynx, and still less so than the stomach and the other parts of the infra-diaphragmatic portion of the alimentary canal.

The epithelium, which covers its mucous membrane, is sometimes eroded, softened, and destroyed, especially in the inferior part of the œsophagus. In some cases I have found the epithelium remarkably thickened.

The mucous membrane of the œsophagus presents the same alterations as in the other parts of the alimentary canal. It is but seldom affected with hyperæmia. It is sometimes thickened, either generally or in patches. Vegetations of various forms and sizes are sometimes found shooting up from its internal surface, narrowing the passage, and offering a greater or less obstruction to the act of deglutition. Ulcers are seldom found on this portion of the mucous membrane. There is a case recorded of the parietes of the œsophagus being found agglutinated by a plastic matter secreted by the mucous membrane, in a person that died of small pox.

In the œsophagus, as in the rest of the alimentary canal, the submucous cellular tissue sometimes becomes indurated, thickened, and transformed either into a scirrhous tissue, or into one of a fibrous or cartilaginous appearance ; thus producing a narrowing, or even a complete obliteration of the passage. The same effect may be produced by the formation of abscesses in the substance of its parietes, or by the developement of tumours in its vicinity. Thus, a constantly increasing difficulty of deglutition has sometimes arisen from the compression of the œsophagus by an aneurism of the aorta, by a mass of obstructed lymphatic ganglions, or by

an exostosis of the body of a vertebra. (Bleu-land.)

The parietes of the œsophagus sometimes become attenuated and softened. One of the consequences of this softening of the œsophagean parietes is their spontaneous perforation, which presents the same anatomical characters as that of the stomach. Some cases have been described of gangrene of the œsophagus; but many of them, if not all, seem to me to be merely cases of pultaceous softening of the part.

Effusion into the thorax is the most common result of perforation of the œsophagus. The perforation, in all the cases hitherto observed, has taken place in the thoracic portion of the passage, near the cardiac orifice; and the surrounding part of the parietes has sometimes been found altered and softened, as already described, and sometimes, without any appreciable alteration. It has been observed at all ages. M. Veron has recorded a case of it in an infant just born. M. Guersent* has published the case of a girl, aged seven, that was carried off by an acute disease of which the predominant symptoms were vomitings at the commencement, and then diarrhœa, coma, and convul-

* Bulletins de la Faculté de Médecine, 1807, p. 73.

sions. The right side of the chest, which had lost its resonance, contained a brown fluid, in which floated flocculi of a deep green colour. There was discovered in the right pleura, a few lines above the diaphragm, an oval laceration in the parietes of the œsophagus. Every where else the parietes of the œsophagus and stomach were sound.

Another case of perforation of the œsophagus, in which there were also four perforations of the stomach, has been given us by M. Bouillaud.[*] The individual had been suffering for six weeks from pain in the stomach. When examined by M. Bouillaud, he presented all the symptoms of acute irritation of the alimentary canal. For the four succeeding days he had copious vomitings, and was then seized with a kind of apoplectic attack, and died in a state of coma. At the moment of making an incision into the thorax, a quantity of gas escaped from its left side; and, on examination, the left lung appeared compressed, and two glasses of a brownish fluid were found in the cavity of the pleura. The pleura itself was injected, and presented several bright red patches. A little above the cardiac orifice, and towards the left side, was a small perforation, and, somewhat

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[*] *Archives de Médecine,* vol. 1, p. 531.

higher, a laceration about an inch and a half in length : the stomach had four perforations in the splenic region, the largest of which was about the size of a six-pence. The gastric mucous membrane was injected generally.

In other cases, the perforation of the œsophagus is stopped up by the aorta, or trachea, so that no effusion takes place ; and in others, a double perforation occurs, and the œsophagus communicates with the interior of the aorta or trachea.

The œsophagus presents the same lesions of secretion as the other portions of the alimentary canal. Pus and tuberculous matter have been found underneath its mucous membrane ; and on its free surface false membranes are occasionally formed. M. Gari, resident physician at the *Hôpital des Enfans-Trouvés,* lately showed me the œsophagus of a new born infant, the internal surface of which was lined, for about a third of its extent, with a layer of whitish, solid matter, which could not be detached without difficulty from the subjacent membrane, and seemed to me to be situated beneath the epithelium. There was no trace of false membrane in the rest of the alimentary canal.

CHAPTER II.

Congenital Lesions of the Portion of the Alimentary Canal situated above the Diaphragm.

THESE we shall now consider successively as they exist in the mouth, pharynx, and œsophagus.

The mouth may be either completely deficient, or only imperfectly developed. The former kind of malformation is termed *astomia*, the latter, *atelostomia*.

The different malformations comprehended under those two generic terms have this remarkable circumstance attending them, that they correspond more or less exactly to the natural state of the different parts of the mouth at various stages of their formation during fœtal life ; whence it follows that many of them are merely the results of an arrest of the developement of the parts affected.

Astomia is the natural state of the fœtus during about the six first weeks of its existence. It may, however, continue up to the period of birth ; and then, in place of mouth, cheeks, &c., we find merely a gaping orifice, situated, sometimes at the base of the cranium, sometimes where the nasal fossæ should be, sometimes towards the middle of the cervical region, and,

lastly, where there is anencephalia, at the most elevated point of the spinal column. Through this orifice there is access to the deeper seated parts of the alimentary canal.

Atelostomia comprizes a great number of malformations which I shall now briefly enumerate.

The face may be completely absent, constituting *aprosopia*, or be but imperfectly developed, *ateloprosopia.*

When *aprosopia* exists, the cranium may be well formed ; imperfect, especially with respect to the frontal bone ; or altogether deficient.

Of *ateloprosopia* there are several degrees. Thus, in some cases, many of the various portions of bone, which when united form the superior maxillary bone, continue in their rudimentary state, or are altogether deficient. In others, the superior maxillary is perfect, but the inferior is absent (*agnathia*) or imperfect (*atelognathia.*)

When there is *agnathia*, instead of the inferior maxillary bone we find nothing but a kind of tubercle formed of skin, cellular tissue, fat, and some few muscular fibres. In such cases, the masseter muscles have been found inserted into the palatine bones. The superior orifice of the alimentary canal is in these cases situated either immediately beneath the fleshy tubercle

already described, or lower down in some point of the neck.

The absence of the lower jaw may be the only malformation of the face ; and, on the other hand, there are cases in which the inferior maxillary is the only one of the bones of the face that is developed.

Atelognathia presents the three following principal varieties : 1. the inferior maxillary bone is of the usual size and form, but is composed of two pieces separated on the median line, as they naturally are before birth ; 2. it is composed of several pieces united by cartilage, which is the natural formation of the bone in birds; 3. it continues very small, and merely exists in the rudimentary state, in which case the chin is remarkable for its little developement.

The lips likewise present some malformations. One, or both, may be absent, which constitutes *acheilia ;* or they may be but imperfectly developed, which is termed *atelocheilia*. The latter results either from the presence of a fissure extending more or less towards the cheeks, where the commissure ought to be, or from the lips being too short to meet, or, lastly, from the division of one or both.

On account of the resemblance of the lip in this last case to that of a hare, this malformation has been termed *harelip*.

The division of the lower lip is very seldom found as a congenital malformation ; however, Meckel and Shubarth have each recorded some instances of it. In the cases related by these authors, the division was in the centre of the lip, the upper lip was also divided, and there were several other malformations besides. It is much more frequently observed in the upper lip, where the longitudinal cleft that constitutes it is but very rarely situated on the median line : Nicati has mentioned a case in which it was so situated, and Lafaye, another, in which there were also two lateral clefts. The lip is generally divided perpendicularly at one or both sides of its middle portion, opposite to where the os incisivum is united to the os maxillare. When one side only is divided, the harelip is said to be simple, when both, double. When simple, it occurs most frequently at the left side. It may be the sole malformation existing, or be accompanied by different degrees of division of the maxillary bone, or other malformations. The malformation most frequently complicated with harelip is the non-union of the os incisivum with the os maxillare. We then find behind the upper lip a small osseous tubercle, distinct from the os maxillare, and containing all the incisor teeth, or only some of them. In this latter case, the incisors which are not contained in the

tubercle, are found in another portion of the os incisivum adhering to the os maxillare ; for that bone (os incisivum) is originally formed in as many distinct parts as there are teeth to be contained in it ; consequently, there are at first four ossa incisiva, two at each side ; and it sometimes happens that they continue separate from each other, or from the maxillary bones, in which case it is observed that the lip continues also divided into as many portions as there are bones that do not unite. This persistence of the division of the os incisivum is the natural state of the part in a great many animals, and in them the lip is also developed in several distinct portions, the separations between which correspond to those between the small ossa incisiva.

Thus, then, the division of the upper lip into several portions appears to be the natural state of the part at a certain period of fœtal life ; and harelip, to be merely the continuance of this state. But there is also a period in the developement of the fœtus, when the osseous partition that separates the mouth from the nasal fossæ, is very incomplete ; and the velum palati, which is the continuation of this partition, is formed in several distinct parts, that do not unite until an advanced period of the evolution of the fœtus. This particular state, which, in the human subject, is natural only in the fœtus,

is permanent in a great many animals : and if we examine successively the mammalia, birds, fishes, and reptiles, we shall find the separation between the cavities of the nose and mouth becoming less and less marked, and at last disappearing altogether ; we shall also find the soft palate becoming divided, or disappearing either wholly or partially. These different conformations, which are thus temporary in the human fœtus, and permanent in many animals, may continue to exist in man also after birth, and are then to be regarded as malformations. The most remarkable are, 1. a simple want of union between one of the palatine processes of the maxillary bone and the os incisivum of the same side ; 2. a similar separation at both sides ; 3. the non-union of the palatine processes themselves ; 4. the complete absence of one or both palatine processes ; 5. the complete absence of the os incisivum, and at the same time, of the middle part of the upper lip ; 6. and lastly, the simultaneous absence of the os incisivum and of the two palatine processes.

In the soft palate we may observe, 1. a non-union of the two lateral parts of which it is originally formed ; 2. those two parts united, but the uvula divided; 3. the uvula in a rudimentary state, or else completely absent, a malformation chiefly connected with the want of developement of the circumflexus palati muscle.

The various congenital divisions of the lips,
and hard and soft palate, that have been just
enumerated, sometimes occur together.

The tongue also is subject to various mal-
formations. However, as it is formed at an
earlier period than the other parts of the mouth,
being visible from the seventh week, it must less
frequently depart from its natural mode of con-
formation.

The tongue may be altogether wanting,
which constitutes the malformation termed
aglossia ; this however hardly ever occurs ex-
cept in those cases where there is at the same
time *acephalia* or *aprosopia.* We must not
confound the true *aglossia* with that which is
only apparent, and arises from the absence of
the internal muscles of the tongue ; constituting
one of the kinds of defective developement
of that organ, comprehended under the term
ateloglossia.

The following are the principal varieties of
ateloglossia.

1. Absence of some of the component parts
of the tongue, as of the muscles on one side, of
the lenticular papillæ, or of the mucous mem-
brane.

2. Smallness of the tongue, or *microglossia.*
In many cases of this description, the smallness
of the tongue depends on the circumstance of

one of the two parts of which it is naturally composed not having been developed. One of these parts consists of the muscles inserted into the os hyoides, and may be termed its hyoidean or posterior portion ; the other or anterior part is composed of muscles terminating in fibrous laminæ situated in various parts of the organ. In the three classes of vertebrated animals provided with lungs, both these portions are to be found, but not equally developed, the anterior predominating in the mammalia, and the posterior, in birds and reptiles. In fishes, the hyoidean portion only is to be found. Now, if we apply these facts to the developement of the tongue in man, we shall find reason to think that its posterior portion is formed first ; that, consequently, it must be much less frequently deficient than the anterior ; and therefore, that, in most cases of *microglossia*, the extreme smallness of the tongue is owing to the absence of the anterior portion. Observation confirms the justness of these theoretic views, for, in all cases of microglossia hitherto examined, it has been ascertained that the tongue was reduced to its hyoidean portion. It then appears at the bottom of the mouth like a small nipple furnished with a few muscular fasciculi that are inserted into the os hyoides and lower jaw. In some cases the mucous membrane is only sufficiently

developed to cover the stump just described; sometimes, however, it is prolonged beyond the stump, and advances towards the lips; but still its folds contain only cellular tissue between them: an arrangement similar to this is observed in some kinds of fish. In many cases of this malformation, the persons affected were not deprived of speech; their pronunciation, however, was not very intelligible; and, in order to articulate, they were obliged to approximate the chin to the larynx. They had also the sense of taste, but were unable to chew their food, or swallow without the assistance of their fingers.

3. *Macroglossia* is the opposite kind of malformation to the preceding; the tongue being larger than natural. We learn from embryology that the tongue has at an early period of fœtal life a much more considerable relative developement than it has subsequently. Now, it is probable that macroglossia results from the nutrition of the tongue continuing for a longer time than usual to proceed as at the earliest period of the evolution of the embryo; in which case we should have an example of the excessive bulk of an organ depending on a real arrest of developement. The same thing may also be observed in the left lobe of the liver, which, being naturally larger than the right in the fœtus, sometimes continues so in the adult. The same,

again, takes place, when we observe in the adult an unusual developement of the thymus, supra-renal capsules, and certain vessels, which, in the natural order of things should diminish in size after birth.

Of macroglossia there are two degrees. In the first, the tongue, though unusually large, is yet not sufficiently so to exceed the limits of the mouth: this, together with thick lips, is one of the characteristics of a scrofulous constitution. In the second, it is so large as to hang out of the mouth.

4. The tongue has sometimes been found bifurcated at its anterior extremity ; a conformation which, as is well known, belongs naturally to many reptiles, such as the snake, and some of the lizard tribe. I am not aware that it has been ascertained to belong to man at any period of his fœtal existence. In most of the cases in which this malformation has been observed in the human subject, it was accompanied by others, such as harelip, cyclopia, and preternatural elongation of the uvula.

5. Examples have been seen of two tongues, situated one over the other. They were separate anteriorly, but united at their bases.

6. There have been also instances of congenital adhesion of the tongue, either to the lower lip, or by its tip to the floor of the mouth.

The two orifices of the mouth are likewise liable to some malformations. Those of the posterior orifice have already been described as irregular conformations of the soft palate. The principal malformation the anterior orifice presents is its occlusion, which may either result from the simple adhesion of the lips, or from their being united by a membrane. The absence of the anterior orifice of the mouth is the natural state of the parts at an early period of fœtal life; so that its continuance is the result of an arrest of developement resembling that which causes the persistence of the membrana pupillaris, or that which keeps the eyelids closed after birth. When there is no aperture between the lips, it sometimes happens that the mouth communicates externally by an opening in some part of the cheeks; in other cases, the mouth has no communication with the exterior, and the superior orifice of the alimentary canal is situated at a greater or less distance from the mouth, as in the neck, for instance.

As the malformations of the teeth are comparatively unimportant in a pathological point of view, I do not think it necessary to dwell upon them here. Whoever wishes for detailed information on the subject may consult the excellent work of M. Serres, *Sur le Développement des Dents*, which he will find fully satisfactory.

The musculo-membranous duct through which the food is conveyed from the mouth to the stomach presents but very few malformations.

We have some cases of complete absence of the pharynx ; but it is a very rare occurrence, and has hitherto been observed only in acephalous monsters. The pharynx has been found to terminate in a *cul-de-sac* at each of its extremities. It has also been found double in fœtuses with two heads and two necks springing from a single body. Lastly, it has been observed to present a partial dilatation, or kind of pouch more or less analogous to that of some species of birds : this pouch was in some cases constituted by all the tunics of the pharynx, and in others solely by the mucous membrane, which was distended, and formed a hernia through the muscular tunic.

The malformations of the œsophagus are somewhat more various than those of the pharynx. The study of its imperfections of developement may serve to throw some light upon its natural mode of developement, which is as yet but imperfectly understood. In some cases, only its superior extremity is found, terminating in a *cul-de-sac*, between which and the stomach there is merely cellular tissue. In others, we find a duct proceeding upwards from the cardiac

orifice of the stomach to the extent of a few inches, and then ending in a *cul-de-sac*, with nothing but cellular tissue beyond it, as in the preceding case. Sometimes it forms a solid cord throughout; at other times, its cavity does not become obliterated until it arrives within a short distance of its insertion into the stomach. In a case of this description, published by Van Cuych, the infant vomited every thing that it attempted to swallow, and died three days after its birth. Sir Astley Cooper has recorded another case in which the œsophagus was totally deficient ; the pharynx terminated in a *cul-de-sac*, and the stomach had no cardiac orifice: the child lived eight days. These various malformations resemble those not unfrequently observed in the rectum. A still more extraordinary case is that published by M. Martin in the *Observateur des Sciences Medicales* (Marseilles, July, 1825). In a child that died thirty-six hours after birth, there was no trace of the pharyngeal extremity of the œsophagus to be found but a canal of a few inches in length, and terminating in a *cul-de-sac*. Just above the region of the bronchia, the trachea presented an orifice, through which a probe was passed into a membranous, elastic duct, of the diameter of a small quill, that led to the stomach, and thus established a communication between the cavity of that

organ and the air passages. In like manner, in many cases of absence of the rectum, we find the colon opening into the bladder or some other organ.

The œsophagus, instead of being absent or imperfectly developed, may have a tendency to exceed its natural proportions. In the first place, this happens in fœtuses that are more or less completely double in their various parts : in those in which two necks spring from a single thorax, the œsophagus is single below, and double above ; in those that have a single neck, and a double thorax, the reverse is the case. This tendency of the œsophagus to duplication has also been observed in cases where no other malformation was to be found. Thus, in Meckel's plates of pathological anatomy, we find the representation of an œsophagus bifurcating opposite the first rib : the branches go off in a semicircular form, and continue distinct till they arrive opposite the sixth rib, when they approximate, unite closely, and at last the œsophagus becomes single again, and continues so for the rest of its course. In other cases the œsophagus becomes dilated below, so as to resemble the crop in birds.

In some cases of general transposition of the viscera, the œsophagus has been found lying on the right side of the body of the vertebræ.

CIRCULATORY APPARATUS.

SECTION I.

DISEASES OF THE HEART.

In this class of diseases we shall find the same lesions as in the other organs whose pathology we have already been investigating ; namely, lesions of circulation, nutrition, secretion, and innervation : but, in diseases of the circulating system, the importance which attaches to these lesions is altogether different from that which they assume in other organs. Thus, in diseases of the heart, *hyperæmia* plays a very secondary part when compared with the important character it assumes in diseases of the lungs and alimentary canal. The lesions of nutrition and secretion are likewise comparatively unimportant, unless when they proceed so far as to produce an alteration in the dimensions of the heart, or a disproportion either in the thickness of its parietes or in the capacity of its cavities, and thereby create an obstacle to the entrance or exit of the blood.

CHAPTER I.

LESIONS OF CIRCULATION.

THE alterations dependant on the quantity of blood which the heart is capable of receiving in its parenchymatous structure, constitute a very small portion of the diseases of that organ. Of the symptoms which during life announce hyperæmia of the heart, we know very little indeed ; and as to the *post mortem* traces of this affection, we must in candour confess, that in many cases it is difficult to decide whether the various shades of red observable in the substance of the heart or on its internal surface, should be regarded as the marks of a hyperæmia formed during life, or as an alteration produced after death and altogether dependant on physical causes.

In fact, the heart is one of the organs which evince the greatest aptitude to these *post mortem* colorations. If we open an animal shortly after it is killed, and examine the heart, we find its internal surface pale, and its substance but faintly coloured ; but if the same heart be exposed to the air and sun for a few hours, its internal surface changes to a bright scarlet, and its muscular structure assumes a deep red colour. When the examination of the body is

deferred, in hot or damp weather, until thirty hours after death, the heart is invariably found red : in some cases the redness is confined to its internal surface, which then appears as if dyed by some red colouring matter, either uniformly, or in isolated patches ; in other instances, the red colour extends through its parietes, to which it imparts a dark livid hue, which is occasionally accompanied by the appearance of ecchymoses on its external surface.

This *post mortem* colouring of the heart is not always found to the same extent even in those bodies that are opened under similar circumstances. *Cæteris paribus*, it is most marked in those individuals who at the time of their death have a large supply of blood in the system ; some bodies too have a much greater tendency to putrefaction than others, and in them the red colour of the heart is always exceedingly marked.

These few observations may serve to render the morbid anatomist cautious how he attributes all red appearances in the heart to inflammation of that organ, as the greater proportion of them should with more propriety be referred to *post mortem* alterations. No doubt, however, can exist that these appearances are occasionally produced during life, and are connected with a true state of active hyperæmia ; as in the follow-

ing instances. During the Summer of 1824, a fatal distemper raged amongst the horses in Paris, at which period I made a great number of dissections immediately after the animals were slaughtered, and generally found the heart of a deep red colour. The redness was in some cases confined to the internal surface of the heart, where it appeared either in detached red points, or else uniformly diffused. In other cases the redness extended to the fleshy substance of the heart, which in those cases was remarkably friable, and easily detached from its internal membrane, underneath which I found in three instances several small deposits of puriform matter. These alterations occurred more frequently in the left than in the right side of the heart. In some cases, they were confined to the aortic valves, which were at the same time swoln and easily broken down into a pulpy mass.

One of the lesions most constantly found in animals poisoned by the deuto-chloride of mercury, is a number of red patches spread over the internal surface of the heart. In this as in the preceding case, no doubt can be entertained that these coloured spots are produced by an active hyperæmia formed during life ; and it is reasonable to conclude that this poison, when administered in sufficient quantity to produce

death, acts on the heart, and produces there an irritation similar to that which, in a weaker dose, it excites in the mucous membrane of the mouth.

But it is not in animals only, that the formation of these different degrees of red colour in the heart can be traced to a period prior to death ; in the human subject likewise, it may in some cases be traced to the same period ; as in the following examples.

1. I examined at *La Charité* the body of a man who had presented many of the symptoms usually attendant on pericarditis, viz. a sudden attack of dyspnœa, dull pain in the precordia, tumultuous palpitations, frequent and irregular pulse, suffocation and death. On dissection no morbid appearance whatever could be detected in the pericardium, or in the substance of the heart ; neither could any trace of disease be discovered in the auriculo-ventricular orifices, or in the blood-vessels. The only appreciable lesion was a bright red colour on the internal surface of the left auricle and ventricle.

2. Another individual who had habitually enjoyed excellent health, was suddenly seized with pain in the cardiac region, dyspnœa, and palpitations such as usually attend on hypertrophy of the heart ; each contraction of the ventricles was followed by a dull "*bruit de rape.*"

Three weeks after the accession of these symptoms, he was attacked with pleurisy, of which he died.   On dissection, the only morbid appearance discoverable in the heart, was a bright red colour of the aortic valves, which were evidently in a state of tumefaction, and contained in their structure two white points formed by a semifluid and apparently steatomatous matter.

3. It not unfrequently happens, that persons labouring under organic affections of the heart are suddenly seized with a violent aggravation of all their former symptoms, and, when death ensues, a bright red colour is discovered in the heart, which cannot be accounted for, either by the putrefactive process, or any other physical cause acting after death.   In some cases, this redness is uniformly diffused, in others it is confined to one side of the heart, whilst in a third set of cases it is still more circumscribed, and exists only in the valves.   In all such cases, is it not an acute hyperæmia supervening on the old affection of the heart, which produces the aggravated symptoms and fatal termination of the disease ?*

Anæmia of the heart has not as yet been made an object of special investigation : all that

* See some arguments in support of this opinion in my *Clinique Médicale.*

we can at present say on the subject is, that
it generally accompanies atrophy of that or-
gan, and, like it, not unfrequently succeeds to a
state of hypertrophy and congestion.   It may,
however, exist independently of the atrophy of
its tissue, as is observed in certain chronic dis-
eases, and in some cases of dropsy, where the
tissue of the heart is found remarkably pale and
exsangueous.

This state of the heart is characterized by a
remarkable discoloration of its tissue, and can-
not be better described than by comparing it to
the appearance which that viscus presents after
a long maceration in water.

CHAPTER II.

LESIONS OF NUTRITION.

These lesions may be divided into two
classes, the first comprehending those which
create an obstacle to the free entrance of the
blood into the heart, or to its expulsion from it ;
the second, those that do not present any ob-
stacles to the circulation of the blood through
the heart.

ARTICLE I.

LESIONS OF NUTRITION THAT IMPEDE THE FREE
CIRCULATION OF THE BLOOD THROUGH THE
HEART.

It has been laid down by Laennec, that the size of the heart is natural when it nearly equals that of the fist of the individual ; whence it follows that the size of the heart is different in different individuals, and that its healthy condition depends more on its relative, than on its absolute dimensions. The parietes of the left ventricle are naturally twice as thick as those of the right ; in the latter, however, the columnæ carneæ are larger, but the network on its internal surface is much coarser and its meshes less numerous. When both ventricles are cut across, the parietes of the right ought to collapse so as to obliterate its cavity, but those of the left ought not. The capacity of both ventricles is in the physiological state equal.

The relative proportions assigned to the ventricles in the preceding paragraph, do not apply to infancy or old age : at both these extremes, the thickness of the parietes of the left ventricle is to that of the right as three or four to one. But, though the proportional thickness of the left ventricle is nearly equal at both these ages,

nothing can be more different than the pulse. The force or hardness of the arterial pulsations do not, then, it is evident, depend exclusively on the thickness of the walls of the left ventricle.

The nutrition of the heart may be so modified as to produce various alterations in the dimensions of its cavities, or in the thickness of its parietes : we shall now proceed to consider these alterations.

Increased thickness of the heart's parietes is generally designated by the term hypertrophy ; indeed the term was originally restricted to this class of affections, although its present application is much more extensive.

Hypertrophy of the heart may be *general*, that is, may affect the parietes of its four cavities ; or it may be *partial*, in which case the left ventricle is most commonly affected. The hypertrophy of this ventricle presents several varieties. It may be exclusively confined to the columnæ carneæ, which then equal or even exceed the natural size of those of the right ventricle. Sometimes the hypertrophy is limited to the pillars of the mitral valve ; in other cases the septum is more especially affected ; whilst in others the increase of thickness extends over the whole of the parietes of the ventricle. In this last case, the thickening may be at its maximum at the base of the heart, and diminish gradually towards its apex, which sometimes retains

its natural thinness when all the rest of the parietes are three, or even four times as thick as natural. In other individuals, again, the thickening is equal and uniform from the base to the apex, which then loses its pointed form, and acquires a rounded shape. Lastly, it sometimes happens that the hypertrophy is greatest about midway between the apex and base of the heart, or is even exclusively confined to that part. When the septum is principally affected, the capacity of the right ventricle is so diminished, that it sometimes looks like a small appendix attached to the left ventricle.

The parietes of the right ventricle are seldom so much hypertrophied as to present an evident thickening to the eye ; Laennec, however, has seen them acquire the thickness of five lines, and MM. Bertin and Bouillaud, of fifteen : the existence of this affection in a minor degree may be detected by the parietes not collapsing when cut across, and by the preternatural developement of the columnæ carneæ.

When one ventricle is in a state of hypertrophy, the other may be so likewise, may retain its natural dimensions, or may be reduced to a state of atrophy.

Hypertrophy of the auricles is very rare, and, when it does exist, is almost always accompanied by hypertrophy of the ventricles.

The parietes of the heart, when affected with hypertrophy, may retain their natural consistence, which is by far the commonest case ; or may be more or less indurated, which is rare; or may present different degrees of softening, which is still more uncommon.

Hypertrophy of the parietes of the heart may accompany different conditions of its cavities ; thus :—1. The cavities may retain their natural dimensions.   2. They may be dilated.   In this case the whole volume of the heart is augmented.   It constitutes the active aneurism of Corvisart, and the eccentric hypertrophy of MM. Bertin and Bouillaud.   3. The hypertrophy may be attended with diminution of the cavities.   (Concentric hypertrophy of MM. Bertin and Bouillaud.)   In this form of the disease, the heart sometimes retains its natural size, in other cases its volume is increased, and in others, diminished.   Each of these varieties is characterized by a peculiar train of symptoms.

We have hitherto considered hypertrophy only as affecting the muscular tissue of the heart ; but there are other tissues in this organ which are liable to have their nutrition preternaturally increased, or, in other words, are subject to hypertrophy.   There are, for instance, certain parts of the heart where the fibrous tissue naturally exists, in such a rudimentary state, however, that it requires a very minute dissec-

tion to demonstrate its existence; notwithstanding which, it sometimes acquires such a degree of developement, as to form considerable tumours, and present a mechanical obstacle to the heart's action. These alterations are most observable in the margins of the several orifices of the heart, and in the valves, the thickening and irregular form of which frequently depend on the hypertrophy of the fibrous tissue which enters in a rudimentary state into their composition. It frequently happens, that this fibrous tissue, at a certain stage of its hypertrophy, changes its nature altogether, loses its fibrous appearance, and is reduced to a homogeneous mass resembling cartilage.

Atrophy of the walls of the heart is less common than their hypertrophy. It may exist without any other alteration of the heart, or it may coincide with an increase in its volume, in which case the cavities are dilated, or lastly, it may be accompanied by a notable diminution in the size of the organ.

Atrophy of the heart sometimes proceeds so far that its parietes are reduced to mere membranes in which scarcely a trace of muscular fibre is distinguishable. In such cases, the fat which naturally exists around the heart is generally much increased, and its secretion becomes more active in proportion as the muscular fibres disappear.

In general, atrophy of the heart comes on
without any assignable cause. As anæmia of
this organ may succeed to its hyperæmia, so
its atrophy may succeed to a preceding hyper-
trophy. Laennec records the case of a woman
fifty years old, who for twelve months had con-
stantly presented all the symptoms of organic
disease of the heart, from which she was subse-
quently relieved by Valsalva's method of treat-
ment. Two years after her recovery, she was
seized with cholera morbus, and died. On dis-
section, her heart was found remarkably small,
scarcely exceeding in size the heart of a child of
twelve years of age. Its external surface bore
an exact resemblance to a wrinkled apple, the
wrinkles being generally directed from the apex
towards the base.

Atrophy of the heart is likewise met with in
those cases where any morbid production, either
solid or fluid, is developed on its surface, or in
its substance. MM. Bertin and Bouillaud
found the heart remarkably small in an indivi-
dual affected with hydrops pericardii. In a case
of chronic pericarditis, where the heart was
enveloped in a thick layer of false membranes,
I found only a delicate layer of muscular fibres
interposed between them and the internal mem-
brane. I likewise observed the same appear-
ances in a child of three years of age, whose

heart was incrusted with a layer of tubercular matter. In these several cases, the atrophy may be considered as the result either of a sort of balance established in the nutritive process, or of the compression exercised on the heart by the morbid productions which surrounded it.

In several diseases in which persons die much emaciated, the heart is found on dissection to have participated in the general atrophy of the muscular system : this, however, is not uniformly the case ; for, in many phthisical patients who die in an extreme state of marasmus, the heart retains its natural volume, or, if its size appears diminished, its diminution is apparent, and depends on the circumstance of the parietes collapsing, in consequence of their containing little or no blood.

There are some cases on record of the walls of the heart being thinner than natural in some points, at the same time that they were preternaturally thicker in others.

The capacity of the heart's cavities may be either increased or diminished. The increase of their capacity may co-exist with, 1. a natural condition of the parietes ; 2. an increase of their thickness ; or, 3. a diminution of their thickness. The second case constitutes the active aneurism of Corvisart ; it occurs more frequently in the left than in the right side of

the heart ; the third, which is more common in the right side, constitutes the passive aneurism of the same author.

The dilatation may affect an entire cavity, or may be confined to a single point, where it produces a sort of pouch communicating with the interior of the cavity to which it is appended. The size of these pouches varies from that of an almond, to that of a large hen egg. In their interior, they generally contain fibrous concretions, formed of successive layers, such as are found in arterial aneurisms, to which indeed the partial dilatations of the heart bear in many respects a striking analogy. The parietes of the cavities from which they grow are in some cases thickened, and in others reduced to a remarkable state of atrophy.

M. Breschet, in an excellent essay in which he has brought together all the cases of this description that have been hitherto published, has described this morbid appearance under the title of *false consecutive aneurism of the heart*. But this denomination, which implies that the aneurism has been formed by the rupture of the internal membrane of the heart, is not, as I conceive, applicable to every case of this affection ; for in some there is no evidence whatever of any such rupture having taken place ; indeed the contrary was clearly established in a case I

examined with my friend M. Reynaud, shortly
after the publication of M. Breschet's paper, in
which we found that the lining membrane of
the left ventricle was dilated in two places so as
to form two pouches, but had evidently under-
gone no solution of continuity in either, the pa-
rietes of the pouches being in fact formed as in
the true primitive arterial aneurism, by the di-
latation of all the coats. On examining the left
ventricle, in this case, we found its internal
membrane considerably thickened, and in many
points of a dull white colour; the subjacent
cellular tissue was likewise preternaturally de-
veloped, and might be divided into several dis-
tinct layers. About the middle of the posterior
surface of the left ventricle, where the alteration
of the internal membrane was most apparent,
there existed a round opening about one fourth
of an inch in diameter, which led into a spherical
pouch as large as a walnut. The parietes of
this pouch were separated from the pericardium
only by a delicate expansion of muscular fibres,
and were formed by a thick layer of dense
fibrous tissue, which by dissection was easily
divided into two layers, one superficial, more
delicate than the other, and of an opake white
colour; the other thicker, resembling the middle
coat of arteries when altered by disease, and
containing in its substance several fibro-cartila-

ginous and osseous points. *This latter mem-brane was uninterruptedly continuous with the internal membrane of the ventricle.* Another pouch of the same description, but of smaller dimensions, was attached to the anterior surface of the same ventricle. They each contained coagula of fibrine.*

Diminution of the capacity of the heart's cavities may be either apparent or real. It is only apparent in those cases of general anæmia where the heart, in consequence of containing little or no blood, is enabled to contract on itself. When the diminution of capacity is real, it may co-exist, 1. with a natural condition of the pa-rietes ; 2. with their hypertrophy ; or, 3. with their atrophy. We have already seen that the capacity of the right ventricle may be materially diminished by the simple thickening of the in-terventricular septum ; the same effect may likewise be produced by the hypertrophy of its columnæ carneæ. Diminution in the capacity of the right ventricle unaccompanied by any other alteration of the heart, is frequently found co-existing with a state of general dropsy.

The alterations in the dimensions and pro-portions of the heart above enumerated may be produced by various causes.

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* For further particulars of this interesting case, see the detailed account published by M. Reynaud, in the 2nd. vol. of the "*Journal Hebdo-maduire de Médecine.*

FIRST ORDER OF CAUSES.

Mechanical Obstacles to the Circulation.

These obstacles may reside either in the orifices of the heart, in the arteries, or in the capillaries.

A. *Obstacles seated in the Orifices of the Heart.*

The orifices of the heart are occasionally so narrowed, either by congenital malformation, or by disease, as to prevent the free passage of the blood. Instead of this simple narrowing of the apertures, the obstacle to the circulation may be produced by various organic lesions of the valves which surround them. These lesions shall presently be described.

The alteration in the dimensions of the heart is generally found in that cavity which discharges its contents through the affected orifice. This rule is not, however, without its exception; for it not unfrequently happens that the cavities at the right side of the heart are altered, when it is at the left side that the affection of the orifices exists. This apparent anomaly is easily accounted for, when we recollect the route which the blood takes in passing from the right to the left side of the heart.

The orifices of the heart may continue for a long time in a state of disease, without producing habitually any appreciable derangement of its action. But, in such cases, any effort, or violent exercise, any mental exertion, or excess of any kind, in short, any thing tending to accelerate the circulation, seldom fails to produce palpitations and dyspnœa.

B.   *Obstacles in the Arteries.*

The aorta sometimes presents from its origin, or from its arch, to its bifurcation, a considerable diminution of its natural caliber ; a malformation which has been repeatedly found co-existing with hypertrophy of the heart's parietes, or dilatation of its cavities. An evident diminution in the caliber of the pulmonary artery has likewise been observed to co-exist with the same alterations in the right side of the heart. It is reasonable, then, to conclude that a considerable degree of contraction of the great vessels into which the heart discharges its contents, must impede its free evacuation, in the same manner as those obstacles which are situated in the orifices of the auricles or ventricles.

On the other hand, the aorta is sometimes found considerably enlarged in individuals affected with hypertrophy of the heart, or dilata-

tion of its cavities. Are we to regard these morbid appearances as cause and effect, or as simple coincidences?

Finally, there is a third class of cases in which the aorta is neither dilated nor contracted, but its coats are incrusted with numerous ossifications. Perhaps this incrusting of the parietes, by destroying their elasticity, deranges the circulation in the aorta, and consequently in the heart also.

C. Obstacles in the Capillaries.

We are altogether ignorant of how far obstacles seated in the general capillary system are capable of affecting the circulation in the heart. But, there are few points in pathology better established than that any impediment to the capillary circulation of the lungs is capable of producing hypertrophy and dilatation of the heart. In fact, the lung in which the circulation of the blood is impeded, or otherwise retarded, is to the right side of the heart, what the liver, when gorged or *obstructed*, is to the vena portæ. I feel quite convinced, from the numerous researches I have myself made on this subject, that the congestion of the bronchial membrane in chronic catarrhs is a frequent cause of the diseases of the heart with which they are so constantly complicated. In such

cases, the difficulty of breathing is often long
antecedent to any local symptom of organic
disease of the heart.   And if, in phthisical per-
sons, disease of the heart is comparatively a
rare affection, although their pulmonary circu-
lation is often so materially impeded, a suffi-
cient explanation is afforded by the circum-
stance of the rapid diminution which takes
place in the mass of their circulating fluid.
Neither do we observe in them those long, dis-
tressing paroxysms of coughing, which occur in
chronic catarrhs, and which by their repetition
necessarily derange and impede the circulation
in the pulmonary artery, and consequently in
the heart itself.

SECOND ORDER OF CAUSES.

*Active Hyperæmia of the Membranes that invest the
external and internal Surfaces of the Heart.*

In another work (the *Clinique Médicale*) I
have endeavoured to prove that a certain pro-
portion of hypertrophies of the heart originate
in an acute or chronic attack of pericarditis.   I
have there related the cases of several indivi-
duals, who, without having previously presented
any symptom of organic disease of the heart,
were suddenly seized with all the symptoms of
pericarditis, from which they recovered, but

still suffered from palpitations and hurried respi-
ration. These, and other symptoms of organic
disease of the heart gradually increased ; and
when at last they terminated fatally, there was
found on dissection, besides the organic disease,
cellular adhesions or other morbid appearances
in the pericardium, which attested the existence
of an antecedent pericarditis.

We have already discussed the question,
how far acute or chronic hyperæmia of the in-
ternal membrane of the heart is capable of pro-
ducing aneurism of that organ. But even
though the facts adduced in support of that
opinion may not be considered conclusive,
would not analogy lead us to admit it ? For,
wherever a muscular membrane contributes to
form the parietes of a cavity, we constantly see
hypertrophy of that membrane produced by an
antecedent hyperæmia of the mucous or other
membrane which lines the interior of the cavity.

THIRD ORDER OF CAUSES.

Modification of the Innervation.

An attentive observation of the commence-
ment of certain organic diseases of the heart
enables us to detect the existence of disease at
a period prior to the formation of any organic
alteration of that organ ; and the symptoms

which we then observe appear in many cases to depend solely on some derangement in the heart's action, independently of any alteration in its texture. In such cases, the heart, which beats too violently or too rapidly, is not more necessarily altered in its organization than any other muscle whose contractions are accomplished irregularly, and independently of the will. Now, the nervous system is the agent of these irregular movements ; it is therefore consistent with the soundest physiology to admit in the case of the heart, as well as in that of the muscles of animal life, that a modification of the nervous influence may cause a modification of its contractions. But, we know that the muscle whose contractions are, for any length of time, rendered more frequent or more violent by the influence of the nervous system, in the end becomes hypertrophied ; and why should not the same cause produce the same effect in the heart ? The term *nervous palpitation* is not, then, as has been said, a phrase by which we endeavour to conceal our ignorance, but the expression of a positive fact. To conclude, the accurate researches recently made on the subject of the morbid anatomy of the heart have clearly proved, that we may find every possible variety of hypertrophy of its parietes, or of dilatation of its cavities, unaccompanied by the

slightest evidence of any antecedent irritation either of its external or internal surface, or the appearance of any obstacle whatever, either in the orifices of the auricles or ventricles, or in the rest of the circulatory apparatus.

ARTICLE II.

LESIONS OF NUTRITION THAT DO NOT ALTER THE DIMENSIONS OF THE HEART.

Among the lesions of this class, there are some which are generally connected with the lesions described in the preceding article, and have but few symptoms peculiar to themselves ; others, again, are made known to us by certain local or general symptoms ; whilst a third set exist without in any wise deranging the action of the heart, and are consequently interesting only to the anatomist.

§ I. *Induration.*

We should distinguish carefully between induration and hypertrophy, for, though generally combined, they are in reality different affections, and may exist each independently of the other. When the heart is in a state of induration, it is particularly firm, and difficult to cut ; when

struck with the scalpel, it sounds, as Laennec says, like a leather dice box. Corvisart states that he has sometimes heard a peculiar crackling sound on cutting into an indurated heart; but Laennec was never able to detect this sound, nor have I myself remarked it.

It sometimes happens, that the heart is indurated in some points and evidently softened in others ; and these two alterations may even exist simultaneously in the parietes of the same ventricle.

§ II. *Softening.*

This alteration may be confined to the internal membrane of the heart, or may affect the whole of its muscular structure. The softening of the internal membrane may be either general or partial ; and in either case the part affected may be of a red or of a pale colour. The softening of the muscular tissue constitutes what is, strictly speaking, termed *softening of the heart*. The heart, when thus affected, is remarkable for its great flaccidity, is easily torn asunder, and is sometimes so remarkably friable, as to allow the finger to pass through its substance on the slightest pressure. The colour of the heart when in a state of softening is very variable : it is in some cases of a bright violet, in others remarkably pale, and in others of a

peculiar yellow tinge, compared by Laennec to the colour of dead leaves. The same pathologist has remarked the first of these colours, (violet) co-existing with softening of the heart in cases of severe fever. The pale colour is less common than either of the others, when the softening is at all considerable ; on one occasion, however, I found the heart as pale as a piece of fibrine from which all colouring matter had been washed away, and at the same time so softened that my finger passed through its parietes on a very slight pressure. Laennec states that he has frequently observed the white softening of the heart in cases of pericarditis ; but the cases which he records are examples of great flaccidity rather than of softening.

The softening of the heart may be either general, or partial. It may be confined to the parietes of one cavity, to the septum of the ventricles, or may affect several isolated points. These softened points may often be recognized by their peculiar colour, even before they are touched. In some cases, there is not the least appearance of softening on the external or internal surface of the heart, but, when cut into, its substance presents several points thus affected. Softening of the heart occasionally co-exists with the hypertrophy of its parietes, and the dilatation of its cavities.

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According to Laennec, we may expect to find the heart softened in those cases where dilatation of that organ has been accompanied by long and repeated attacks of suffocation ; where the mortal struggle has been protracted for several weeks ; and where the violet colour of the face and extremities has announced long before death the stagnation of the blood in the capillary system.   I do not mean to deny that the heart may occasionally be found softened after this series of symptoms, but I can affirm from my own experience, that it by no means necessarily follows.   There is another assertion of Laennec's, which I think requires further confirmation before we can admit it as well established, namely, that the yellow softening of the heart is generally accompanied by a certain degree of cachexy.

Softening of the heart may, like that of other organs, succeed to an attack of irritation ; but it is absurd to suppose that the pre-existence of irritation is indispensably requisite to its formation.   Compare the muscles of a man who dies suddenly of apoplexy, with those of a person exhausted by consumption : what an extraordinary difference will you find in their consistence and density, and yet how little of that difference is caused by irritation !   In fact, there is no immediate connexion whatever between

the irritation and the softening of a muscle : in this, as in other cases, the effect of irritation is to cause a deviation from the natural healthy action of the part ; but such a deviation may be effected by a variety of other causes.

In the present state of our knowledge, we may admit the following species of softening of the heart, founded on the circumstances which precede or accompany its developement.

1st Species.—Softening connected with active hyperæmia of the heart.

2nd Species.—Softening connected with anæmia of the heart.

3rd Species.—Softening connected with atrophy of the heart.

4th Species.—Softening connected with an acute alteration in the general nutritive process (as in typhus.)

5th Species.—Softening connected with a chronic alteration in the general nutritive process (as in a variety of chronic diseases.)

6th Species.—Softening, which we are not as yet enabled to refer to any morbid condition of the heart itself, or of the rest of the system.

§ III. *Solutions of Continuity.*

Ulceration of the heart is comparatively a rare affection ; it may either attack its internal

membrane exclusively, or may extend into its parenchyma ; in the latter case, the ulcers may be either superficial, or may burrow so very deeply as to have their bottom formed by a thin stratum of muscle, or even by the pericardium itself, and in some cases this membrane too is destroyed and the ulcer is thus converted into a perforation.

We are not, however, to suppose that this is the only way in which perforations of the heart are produced. They may succeed to other morbid alterations, such as softening, either local or general, or may even take place without exhibiting any appreciable lesion whatever.

Cases have been recorded, in which rupture of the heart has been said to succeed to falls or violent efforts : it has also been observed, in some few instances, to follow a violent shock or strong mental emotion : I can hardly conceive such a cause sufficient, unless where the heart was predisposed to rupture by some preceding lesion.

Theory would lead us to suppose that it is in those points where the heart is thinnest, that it is most liable to rupture ; experience, however, proves the contrary ; for the middle part of the walls of the left ventricle is, of all parts of the heart, the most frequently ruptured, whereas perforations of the right ventricle

are exceedingly rare, and of the auricles still more so.

In the neighbourhood of the perforation, the heart may present any of the following conditions : 1. it may be exempt from any appreciable alteration whatever ; 2. it may be softened to a greater or less extent round the perforation ; 3. it may be in a state of hypertrophy, with, or without softening ; or, 4. it may be ulcerated in several points. In this last case, which is by no means uncommon, several ulcers are found, either in the vicinity of the perforation, or in some other part of the heart, burrowing to various depths, some eating entirely through the muscular substance, and reaching the pericardium, which then comes into immediate contact with the blood. At a recent meeting, I exhibited to the *Academie Royale de Medecine*, a heart which had five perforations in the posterior surface of its left ventricle ; its muscular tissue had no appearance of softening.

Perforation of the heart is generally followed by sudden death, not in consequence of the hæmorrhage which ensues, for the pericardium necessarily limits its quantity ; indeed, in several cases of this description which I examined, I found only a small clot of blood, not even sufficient to distend the cavity of the pericardium. It is most probable that death is caused in these

cases by the violent shock to the whole system, produced by the sudden derangement of the heart's functions.   Of the individuals who died under my care, in consequence of rupture of the heart, some had for a long time previously manifested the usual symptoms of organic disease of that organ ; others had never betrayed any symptom of disease either of the heart or large vessels ; and others, again, had complained occasionally of uneasiness or pain in the precordial region, unattended with any other morbid symptom.

Instead of ensuing, as it generally does, almost instantaneously, death in some cases does not take place for several hours, or even days, after the accident, in which case the perforation is found plugged up by a coagulum of fibrine. Is it possible that this coagulum could become the medium for forming a true cicatrix, as in wounds of arteries, and, consequently, that perforation of the heart is not necessarily mortal ?

Perforations of the heart from penetrating wounds do not differ in any essential particular from those we have already described.   A remarkable case of this description is related by M. Dupuy,* in which the penetrating instrument first passed through the stomach, and af-

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* *Journal de Médecine Vétérinaire*, par Dupuy, Année 1826, p. 24.

terwards pierced the heart: the animal (a bull) lived fourteen days after the injury.

Besides the species of rupture already enumerated, there is yet another to which the heart is liable, namely, that in which the rupture is seated in the chordæ tendineæ, or in the carneæ columnæ. Corvisart relates three cases of one of the chordæ tendineæ being torn across during violent efforts ; and Laennec mentions his having found one of the tendons of the mitral valve ruptured in an individual affected with hypertrophy and dilatation of both ventricles ; one of the other tendons was likewise remarkably thin and delicate near its valvular extremity. Lastly, in a young woman labouring under phthisis, M. Bouillaud found one of the columnæ carneæ into which the tendons of the tricuspid valve were implanted, ruptured right across.

Solutions of continuity of the heart may likewise commence at its external surface, and proceed from the pericardium inwards. One of the most interesting cases of this description on record, is to be found in the *Mémoirs de la Societe Royale de Medecine* for the year 1776. A young woman, aged twenty-two, was sent for disorderly conduct to the House of Refuge at Perpignan. She was then suffering from a sense of weight and uneasiness in the cardiac region. She had likewise leucorrhea, chancres

on the vulva, and condylomata round the anus. Under the mercurial treatment the syphilitic symptoms disappeared, but the sense of uneasiness in the chest still continued, and about six months after her admission she began to complain of an acute lancinating pain darting from the outer side of the left breast to the middle of the sternum. The pulse became small, frequent, and irregular, and was even altogether suspended for several seconds while the pain was particularly violent. The patient continued in this state of suffering for two years, and then sunk under it. On dissection, the heart appeared carcinomatous, the pericardium was completely sloughed away, and the external surface of the posterior side of the heart was occupied by a large ulcer, the bottom of which was formed by a thin layer of muscular fibres, so soft and friable as to break down under the slightest pressure from the finger. All round the ulcer the heart was remarkably indurated, and presented the usual characters of *scirrhus*. The circumference of the heart just below the auricles was eleven inches eight lines, and that of the ulcer, nine inches two lines and a half.

CHAPTER III.

Congenital Malformations.

THE greater part of these lesions proceed from an arrest of developement, and represent the different conditions of the heart as it is found in the various gradations of the animal series, or in the human embryo, at the different stages of its evolution.

The congenital malformations of the heart may be classed as follows :

1. Absence of the heart.
2. Imperfect developement of the heart.
3. Excessive developement of the heart.

After describing these several alterations, I shall notice the unnatural directions and situations of the heart.

§. I. *Absence of the Heart, or Acardia.*

There is a period in the evolution of the embryo, when no trace of the heart is perceptible, though blood vessels can be distinctly perceived. This state of the parts, which is natural at an early period of fœtal existence, is occasionally found much later, and even after the ninth month. In place of the heart, which in such cases is altogether deficient, there is some-

times found a vascular network, unconnected with any large vessel, as in zoophytes ; sometimes the umbilical vessels alone are found, communicating in the body of the fœtus with some minute vascular ramifications ; and lastly, the umbilical vein is in some instances found to communicate directly with the arterial system.

Almost all the cases of acardia hitherto observed have been in fœtuses wanting the brain and spinal cord ; and it is a remarkable fact, that the heart is almost invariably wanting in acephalous monsters. Indeed, so well is this fact now established, that in a dissertation on *acephalia,* published by Elben, (Berlin, 1821), the term acephalia is used as synonymous with acardia, the title of his treatise being " *De acephalis, sive monstris corde carentibus, dissertatio.*"

The heart may, however, though much more rarely, be wanting in fœtuses provided with a brain and spinal marrow. A well authenticated case of this description is fully detailed in the 2nd volume of the *Repertoire d'Anatomie, &c.* In the place usually occupied by the thoracic viscera, nothing was to be found but a sac filled with water ; there was neither heart, lung, trachea, vena cava, aorta, nor thymus ; the ribs were well formed. The brain, cerebellum, and medulla oblongata, presented their natural ap-

pearance : the optic nerve was wanting, as was likewise the olfactory; and both the eyes and nose were imperfectly developed. The alimentary canal likewise presented several malformations.

§. II. *Imperfect or irregular Developement of the Heart, or Atelocardia.*

Almost every variety of form which the heart presents in the different gradations of the animal series has been observed in the human subject.

A. A single auricle and ventricle ; the pulmonary artery given off by the aorta.

B. Two auricles divided by an imperfect septum ; a single ventricle ; the pulmonary artery and aorta each arising separately from the ventricle.

C. Auricles imperfectly divided ; two ventricles, their septum only rudimentary. In all such cases, the septum first begins to appear at the apex of the heart, and gradually extends towards its base.

Separation of the ventricles perfect, that of the auricles incomplete ; foramen ovale open. This latter malformation not unfrequently co-exists with the absence or imperfect developement of the septum of the ventricles.

E. The right auriculo-ventricular orifice wanting ; foramen ovale and ductus arteriosus open.

These different degrees of imperfect developement of the heart frequently co-exist with other malformations, likewise produced by imperfect developement ; but they are also found co-existing with the malformations of other parts arising from an opposite cause, namely, excess of developement ; as if the nutritive process, in order to compensate for its excess in one part of the body, was deficient in another.   Thus, in those fœtuses which have almost all the organs double, we not unfrequently find the heart consisting of a single auricle and ventricle, or perhaps of two auricles and one ventricle.   In some cases of double fœtus, two aortas or two pulmonary arteries arise from a single ventricle.

The heart may, however, be imperfectly developed in individuals who are perfectly formed in every other respect.   In this case, the malformation is not necessarily incompatible with life, as is proved by the circumstance of our not unfrequently finding the septum of the auricles or of the ventricles deficient to a greater or less extent in the bodies of adults, or even elderly persons.   In all such cases, there must necessarily have been a mixture of the venous with the arterial blood ; notwithstanding which, the dis-

ease termed *cyanosis* does not always accompany the malformation.

§. III. *Excessive Developement of the Heart.*

The heart, instead of being arrested in the progress of its evolution, may have its developement preternaturally increased, and thus present any of the following malformations.

A. A supernumerary cavity, forming a sort of accidental appendage to one of the auricles or ventricles, and communicating with the cavity of the part to which it is attached.

B. A supernumerary septum, forming an imperfect division of one of the natural cavities.

C. A second cavity completely partitioned off by one of these septa, and giving off supernumerary vessels which communicate with the regular vessels of the heart.

D. Supernumerary auricles and ventricles. I have seen a heart with three auricles, and another with four ventricles.

E. All the parts of the heart double. In this species of malformation there are really two hearts; but their arrangement is liable to considerable variety. Thus, they may be both enclosed in one pericardium, and united together, their cavities either communicating or not. Sometimes the two hearts have each a peri-

cardium of its own, and are united at their apex, or remain isolated and distinct from each other. We very rarely find any of these varieties of double heart, except in those monsters which have all the other parts double. There are, however, a few exceptions. Winslow relates a case in which a double heart was found in a single thorax, while the œsophagus and trachea were wanting, and the fœtus had cyclopia. This case is precisely the reverse of that of double monsters with a single heart.

§ IV. *Alterations in the Line of Direction of the Heart.*

M. Breschet has seen four instances of the natural direction of the heart being so altered, that the organ might be said to be in the right side of the thorax, the apex occupying at the right side the position it generally maintains at the left. The subjects of these observations were young infants, otherwise well formed. This malformation is not always congenital : it may be produced by a variety of causes, such as an accumulation of fluid in the left pleura, which sometimes causes the heart to assume a vertical position and occupy the median line, and sometimes thrusts it over, so that the apex pulsates against the ribs of the right side.

§ V. *Displacement of the Heart.*   (*Ectopia cordis.*)

We have a great number of cases on record of the heart's being situated out of the thorax, and occupying a place at a greater or less distance from its natural situation.   In one case, it has been seen forming an anomalous tumour in the neck ; in another, it has been found in the abdomen : Dr. Deschamps de Laval * relates an instance of the heart's being found below the diaphragm, occupying the place of the left kidney ; the aorta and other vessels passed through the diaphragm, and assumed their natural position in the thorax.   The individual in whom this remarkable malformation was observed was a middle aged man.   In the Journal of the Medical Society of Bourdeaux for 1825, is detailed the history of a female infant, who at her birth had a pulsating tumour extending from under the false ribs to the umbilicus : she lived two years and a half.   On examination after death it was found that the tumour was formed by the heart, which thrust the diaphragm down before it, and reached with its apex to the umbilicus.

A still more extraordinary malformation is

* *Journal général de Médecine,* tom. xxvi.

where the heart approaches the head ; as in the case recorded by Beclard,* where the heart was situated immediately under the palate.

There are also many cases of ectopia of the heart, which proceed altogether from a defective developement of the thoracic parietes : thus, when the sternum or a portion of the ribs is deficient, the heart protrudes through the aperture ; and when the diaphragm and abdominal parietes are also wanting, we find only one large tumour, containing the abdominal viscera in its superior portion, and the thoracic in its inferior.

CHAPTER IV.

LESIONS OF SECRETION.

In the natural or healthy state, the only secretions which take place in the heart are, the secretion of fat between its muscular fibres, and the insensible exhalation of serous fluid, such as is constantly going forward in every part of the living body. Hence we have naturally two orders of the lesions of secretion ; one consisting in a modification of the fatty exhalation, the other in a modification of the serous exhalation.

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* *Bulletins de la Faculté de Médecine,* tom. ii.

ARTICLE I.

LESIONS OF THE FATTY EXHALATION OF THE HEART.

THERE is a certain quantity of fat naturally deposited round the heart. In chronic diseases, where the general emaciation is considerable, this quantity is diminished, or even totally disappears. On the other hand, the quantity of adipose matter is sometimes excessive; and it then penetrates between the muscular fibres of the heart, which, in consequence, become pale and wasted. This has been called the *fatty degeneration of the heart*, though in reality the muscular fibres are not converted into fat, but are only less apparent than usual, in consequence of the excessive deposition of fat between them. In some cases, however, it would appear that the muscular fibre itself had undergone a fatty transformation, a matter capable of greasing paper and the scalpel being found not only between the fibres, but infiltrating their texture. I have never myself seen this transformation of the muscular fibre into fat, but at the apex of the heart; neither has Laennec seen it except in the same situation, or in other very circumscribed spots. It is accompanied by a yellow tinge like that of decayed leaves.

It has been laid down, that persons whose heart is in a state of atrophy, and at the same time overloaded with fat, are more liable than others to die of perforation of that organ. A case in favour of such an opinion is given in M. Bouillaud's work. A priest died suddenly, and on examination it was found that there was perforation of the right auricle, and that the whole heart was "*prodigiously fat :*" no mention is made of the state of the muscular fibres. The accumulation of fat about the heart was at one time considered a cause of asthma and sudden death ; and such may be the case, but as yet we require proofs of the fact.

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ARTICLE II.

LESIONS OF THE PERSPIRABLE EXHALATION OF THE HEART.

This exhalation is to be considered, 1. in the parenchymatous substance of the heart ; and, 2. on the surface of its cavities.

§ I. *Lesions of the Perspirable Exhalation in the Parenchyma of the Heart.*

The quantity of perspirable fluid which the cellular tissue of the heart exhales is sometimes so much increased, as to produce a serous infil-

tration, a true œdema of that viscus. M. Bouillaud, who has described this morbid appearance, has only seen it in cases of general dropsy, and attributes it to the same causes as produced the general affection.

Instead of the perspirable fluid, we sometimes find separated from the blood certain morbid productions, both solid and fluid. These, like the perspirable fluid itself, may be deposited either on the surface or in the substance of the heart.

The simplest of these productions consists of a white substance, without any trace of organization, which is frequently deposited on the surface of the heart, where it presents the appearance of a dirty white patch : its seat is evidently in the fine cellular tissue that unites the heart to its enveloping membrane. As this white substance increases in thickness, it assumes more and more the appearance of cartilage. It is also deposited, and even more frequently than in the preceding situation, between the reflections of the internal membrane that compose the valves, and here it is peculiarly apt to become incrusted with the calcareous phosphates.

The deposition of saline matter in this morbid secretion has been improperly denominated by some authors *ossification of the heart :* this term should be restricted to those cases where

the heart itself, or one of its component tissues, is converted into bone.

The true ossiform degeneration of the heart may be divided into three species, according as it is situated in the cellular, fibrous, or muscular tissue.

The first and most common species of ossiform degeneration has its seat in the cellular tissue that unites the several anatomical elements of the the heart together. In this tissue, the calcareous phosphates are deposited, either in the form of minute grains, or of masses of considerable bulk. These grains or masses are deposited between the tissues, which they separate and compress, but do not destroy. They occur most frequently in the neighbourhood of those parts where fibrous tissue exists, such as round the orifices of the auricles and ventricles, along the chordæ tendineæ of the mitral valve, and in the substance of the aortic valves. They are also observed, but more rarely, in the fleshy substance of the heart, where they either form isolated tumours, or are connected by prolongations of the same matter with other calcareous deposits formed round the orifices.

The second species of ossiform degeneration of the heart is seated in the fibrous tissue, which then appears actually transformed into calcareous matter, though it never presents the out-

ward appearance or the internal texture of the true bones. This transformation occurs chiefly in three points : 1. in the tendinous zone that encircles the left auriculo-ventricular orifice, which is thus converted into a bony ring ; 2. in the valves ; when ossification of the valves arises from this transformation, the calcareous matter does not appear in irregular masses, but is situated within the valves, and observes the same arrangement as the fibrous tissue itself did ; 3. in the tendons that unite the mitral valve to the columnæ carneæ of the left ventricle.

The third species of ossiform degeneration, which is by far the rarest, is seated in the muscular tissue. In some cases it is confined to one of the columnæ carneæ ; in others, it involves a considerable extent of the muscular substance of the parietes. Examples of this perfect conversion of the muscular substance into bone are so few, and those few so vaguely described, that additional observations are desirable before the fact is definitively admitted. One of the most remarkable cases of this description is that recorded by M. Renauldin.* In a man thirty-three years of age, the heart was found remarkably hard and heavy. On attempting to cut into the left ventricle, con-

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* *Journal de Corvisart*, Janvier, 1816.

siderable resistance was experienced, in conse-
quence of the perfect conversion of its parietes
into a petrified mass, which had in some parts a
gritty, mortar-like appearance, and in others
resembled a saline crystallization. This mass
of calcareous matter extended from the surface
of the ventricle to its columnæ carneæ, which
were likewise petrified, and considerably en-
larged, but retained their natural form. Many
of them were as thick as the tip of the little
finger, and resembled so many stalactites lying
in different directions. The temporal and max-
illary arteries, and a portion of the radial, were
ossified on each side. The difficulty in these
cases is to ascertain whether the calcareous
matter is deposited in the muscular fibre itself,
or in the cellular tissue which unites these
fibres.

It remains still to be explained why the ossi-
form degeneration is almost exclusively confined
to the left side of the heart, although the structure
and organization of both sides seem precisely
the same. Another circumstance which we are
equally at a loss to account for, is the frequency
of this degeneration in old age, and its compara-
tive rarity before the age of fifty or fifty-five.*
It is one of those striking examples, of which

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* Vide *Clinique Medicale.*

we possess so many, of the subordination of local affections to certain general modifications of the system.

The morbid productions just enumerated are found only in the heart, and never in any other part of the body ; but there are others to which the heart is liable in common with every part of the body where cellular tissue exists.   Of this description are the purulent collections which are sometimes found in that organ, varying in size from that of a pea to that of a hen egg. The tissue of the heart immediately around these purulent deposits is in some cases redder than natural, and softened ; in others it appears perfectly healthy.

Abscesses of the heart are of two sorts : the one produced by a morbid condition of the heart itself; the other occurring only in those cases where there has been a suppurative process going forward in some other part of the body, from which the pus is absorbed into the circulation, and subsequently deposited in different points of the system.   A short time since, my friend M. Reynaud shewed me a heart which had several collections of pus in the substance of its parietes, and at the same time had a considerable quantity of the same fluid mixed with the blood contained in its cavities.

The old authors make frequent mention of

abscesses of the heart ; but an attentive perusal of their descriptions is sufficient to convince us that they mistook for abscesses, simple collections of pus in the sac of the pericardium. These collections are, however, sometimes accompanied by a true suppuration of the heart itself. In a little girl ten years old, whose pericardium was filled with pus, I found an abscess the size of a nut in the parietes of the left ventricle, completely isolated from the collection in the pericardium. Laennec likewise found a small abscess in the left ventricle of the heart in a child who died of pericarditis.

The morbid productions known by the name of *tubercles*, *scirrhus*, and *encephaloid*, are also found occasionally in the heart. Laennec only saw three or four cases of tubercles in that organ, it being one of those in which they are most rarely developed : indeed, so far as my experience goes, they are never found there but when they exist at the same time in several other organs.

Scirrhus and encephaloid are of almost as rare occurrence in the heart as tubercle is. MM. Bayle and Cayol state, in the article on cancer, in the *Dictionaire des Sciences Medicales*, that they have never seen an instance of scirrhus of the heart. Laennec * saw but two cases of

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* *Traité de l'Auscultation*, 2 edit. tom. II. p. 570.

encephaloid of the heart : in one, the morbid matter formed several small masses in the muscular substance of the ventricles ; in the other, it was deposited in layers from one to four lines thick, along the coronary vessels. M. Recamier found the heart partially converted into a substance like the skin of bacon in an individual who had also cancerous tumours in the lungs. M. Cruveilhier * saw a number of encephaloid masses in the substance and on the surface of the heart of an old man. M. Rullier found almost the entire substance of the heart degenerated into a scirrhous mass, which formed irregular knobs ("*bosselures*") on the external and internal surface of the heart : there was also a carcinomatous tumour in the mesentery. M. Olivier, in his work on the spinal marrow, relates another case of the encephaloid degeneration of the heart. M. Velpeau has published a remarkable case of encephaloid tumours deposited in the substance of the heart : similar tumours were also found in the lungs, between the pleura and ribs, in the bronchial glands, under the mucous membrane of the stomach, in the duodenum, in the pancreas, in the right kidney, in the liver to the amount of several hundreds, between the tunics of the gall-bladder, in

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* *Essai sur l'Anatomie Pathologique.*

different parts of the peritoneum, on the upper surface of the brain, in the thyroid gland, and lastly, under the skin and in the muscles of the right thigh.

I have myself twice seen the lesion of which I have quoted so many examples: in both instances, the right side of the heart was the part affected. In the first case, the patient, who was fifty-six years old, presented only the usual symptoms of hypertrophy of the left ventricle, which, on dissection, he was found to have. In addition to this, almost the whole of the walls of the right ventricle and auricle were converted into a hard, dirty-white substance, traversed by a number of reddish lines, and possessing all the characters of encephaloid. It was really surprising in this case how the right auricle and ventricle were capable of propelling their contents, and keeping up the circulation.

In the second case that fell under my observation, the deposition of encephaloid matter was not so extensive. The external wall of the right ventricle was occupied by a large knotted tumour, extending from its apex to its base, which projected so far externally as to lead us to mistake it for a supernumerary heart, and likewise protruded internally into the cavity of the ventricle. When divided, it was found to be composed of the substance named encepha-

loid, in some points hard, and in others, soft and diffluent. The patient was thirty-seven years old at the time of his death, and had enjoyed good health until two years previously, when he became slightly asthmatic ; in this state he continued for five or six months, when he was suddenly seized one morning after breakfast with the most excruciating pain, at first confined to the region of the heart, but soon extending over the whole left side of the thorax. At the same time, his dyspnœa increased, and he had violent palpitations and vomiting ; after an hour the pain abated, and the next day he was as usual. During the following year his difficulty of breathing gradually increased, and he had seven or eight returns of the same pain, which he compared to that of violent toothache. At the time of his admission into *La Charité*, he was considerably emaciated, his face had a peculiar sallow tinge, and every evening there was a slight accession of fever. During the first month after his admission he had repeated attacks of violent pain of short continuance. He had occasionally violent palpitations ; but in the interval between those attacks there was no stethoscopic evidence of disease either in the heart or lungs. He lingered out a few weeks longer, became œdematous, and died suddenly without any struggle.

To conclude the enumeration of these cases, M. Billard * found in an infant only three days old, three tumours imbedded in the heart, and possessing all the characters of scirrhus.

The only other morbid productions that have as yet been observed in the heart are serous cysts, and hydatids.

The serous cysts vary in size from that of a pea to that of a large hen-egg. Their general situation is between the external surface of the heart and the pericardium, but they are sometimes seen projecting from its internal surface. M. Dupuytren † saw a number of these cysts imbedded in the walls of the right auricle, and protruding a considerable way into its cavity. In other cases, these cysts are not visible on the external or internal surface of the heart, and it is only on dividing the muscle in which they are imbedded that we discover their existence. I have seen myself but one case of this description : the cyst, which was as large as a walnut, was imbedded in the side of the left ventricle, which was slightly affected with hypertrophy.

The only instance, I believe, on record, of these cysts being developed on the free surface of the lining membrane of the heart, is one

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* *Traité des Maladies des nouveau-nés, &c.*, pag. 647.

† *Journal de Corvisart, &c.* tom. v. pag. 139.

which fell under my own observation. A small serous cyst, about the size of a nut, was attached to the internal surface of the right ventricle, near its auricular orifice, by a delicate pedicle, apparently of the same texture as the internal membrane.

The developement of serous cysts in the heart has been noticed by almost all the old writers on morbid anatomy.

Instead of simple cysts, we sometimes find that species of hydatid known by the name of *cysticercus*. I have frequently seen it in the hearts of measly pigs, and once only in the human subject. On examining the heart of a person that died at *La Charité*, I found three small vesicles, each about the size of a nut, and perfectly transparent, with the exception of one white point, which, by pressure, was made to protrude like a head from the interior.

§ II. *Lesions of the perspirable Exhalation in the Cavities of the Heart.*

These alterations are few in number, and rarely met with. I do not know of any morbid productions being found in the cavities of the heart, except pus and false membranes ; and it is very difficult in many cases to decide whether the pus so found is really the product of inflam-

mation of the lining membrane of the heart, or
not, as it may be conveyed thither in the torrent
of the circulation from some other part in a
state of suppuration.

False membranes are sometimes found lining
portions of one or more of the heart's cavities.
The surface underneath these layers is in some
cases described as red ; in others, its colour is
not mentioned.   We should not confound with
false membranes the pellicles which are often
found lining the internal surface of the heart,
as the latter are formed after death by the mere
physical arrangement of a certain number of
molecules of the blood in a state of stagnation.

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CHAPTER V.

*Lesions of the Blood contained in the Cavities of
the Heart.*

ALL pathologists of the present day are
agreed that some of the coagula found after
death in the heart have been formed there
during the life of the individual.   The great
consistence of these coagula, their close adhe-
sion to the substance of the heart, and, in some
cases, their evident organization, fully establish
the fact that the blood may, during life, coagu-

late in the cavities of the heart, and there become the nidus of several morbid alterations.

The intimate connexion that is formed between the coagulum and the heart is the simple consequence of a very general law, by virtue of which, two parts endowed with life cannot remain in contact without being united to each other, by a process somewhat resembling that by which grafting takes place in the vegetable kingdom.

The formation of vessels in the coagulum is the result of another law in the animal economy, namely, that every particle of blood which remains in a state of stagnation in the living body has a constant tendency to become organized. Two remarkable examples of the organization of these coagula are recorded by M. Bouillaud, in his very interesting essay on the obliteration of veins. In one of these, the right auricle was almost completely filled by a soft coagulum traversed in every direction by an infinite number of minute vessels, some of a bright red, and others of a dark colour. In the other, the right auricle and ventricle contained masses of albuminous and fibrinous matter, evidently organized, and connected with the parietes of their respective cavities by filaments which it was necessary to tear before they could be detached. The individual who formed the subject of this case died

with all the symptoms of aneurism of the heart. To these facts I shall add another, published by Doctor Rigacci in Italy, and noticed in the *Bulletin des Sciences Medicales* for September, 1828.—A lady had for several years presented the usual symptoms of aneurismal dilatation of the heart. On dissection, the left ventricle was found dilated, and its walls considerably attenuated. Its cavity was filled by a substance resembling flesh, which seemed to arise by two distinct roots, one implanted in the columnæ carneæ, the other in the mitral valve. Three reddish filaments likewise passed from the columnæ carneæ, and entered the substance of the polypous mass: these had all the appearance of blood-vessels, and, when injected with mercury, were found to divide into a number of small branches that ramified through the substance of the polypus. By careful dissection, it was ascertained that the tumour was formed altogether of a mass of fibrine, such as is found in the sac of arterial aneurisms.

If once we admit that polypous concretions in the heart may become organized, it follows as a necessary consequence that they may have different morbid productions formed in their interior. Several instances have already been mentioned in this work, of pus having been found in these concretions; and though we may in some cases suppose that the pus was

not actually formed in the coagulum, but only brought into the heart with the blood, in which it was circulating, yet there are others in which it is impossible to account for its presence in the coagulum, otherwise than by admitting its having been formed there. If, then, pus is formed in the interior of these polypous concretions, there is no reason why cartilaginous and osseous productions may not likewise be developed there. Burns found one of these polypi of the size of a hen-egg ossified in several points, and so perfectly organized, that, on inflating the coronary vein, a number of minute vessels on the surface and in the substance of the tumour became distended with air. In another case mentioned by Cruwell,* a small globular body, principally composed of cartilage and bone, and containing a cavity in its interior, was found wedged in between the valves of the pulmonary artery. This case was likewise remarkable as presenting one of the most extensive ossifications on record of the right side of the heart : under the lining membrane of the auricle and ventricle there were several plates of bone, which were prolonged into the fleshy substance of the ventricle; many of the columnæ carneæ were ossified; and both venæ cavæ had several patches of osseous

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* De cordis et vasorum osteogenesi in quadragenario observata. Halæ, 1765.

incrustation. It would seem in this instance that the blood which coagulated during life in the right side of the heart took on the ossific process, because, having once become solid and organized, it should, by a general law of the economy, participate in the life of the surrounding solids, and in their morbid conditions also.

The fact of the organization of these concretions affords likewise the most probable explanation of the mode of formation of those vegetations which are occasionally found on the inner surface of the heart, especially on the valves. Nothing can be more accurate than the description Laennec has given of the several phases through which these vegetations pass, from the period when they yet resemble an amorphous mass of fibrine, precisely such as is formed by a coagulum of blood, up to the time when they are traversed by vessels of their own, acquire their determinate form, and seem to be an excrescence from the membrane on which they are situated.

It would be an endless task to attempt an enumeration of the different forms which these vegetations may present ; I shall therefore only enumerate a few of the principal varieties, in order to show how productions originally the same may subsequently, by a simple modification of form, assume an aspect so totally different

from each other, that it is only by an attentive examination of all the intermediate phases that the identity of their origin can be recognised. Thus, some of them bear a striking resemblance to venereal warts, others to those syphilitic productions named cauliflower excrescences, others are like strawberries, whilst others assume a cylindrical or a tapering form. Sometimes they appear as minute granular bodies closely studding over that portion of the lining membrane to which they are attached; in other cases, again, they assume the form of hollow globules or vesicles containing a variety of substances in their interior, such as pure blood, either fluid or coagulated, a substance like the lees of wine, or, lastly, a puriform matter, which is evidently nothing else than fibrine deprived of its colour and altered in its qualities; indeed this is one of the cases where we can most satisfactorily trace the transformation of fibrine into puriform matter. These vegetations, whatever be their form, may be attached to the wall of the heart either by their surface, or by a neck or peduncle of variable length, which is generally entangled in the meshes that exist on the internal surface of the cavities. If we examine the structure of these peduncles, we at once see that they are composed simply of fibrine, which generally retains more of its original character of a coagulum than the

vegetations to which they are attached; from
whence we might in such cases reasonably infer
that they are posterior to them in the date of
their formation.

The colour and consistence of these vegeta-
tions furnish additional arguments in favour of
the origin which we have assigned them : thus,
they may be either red, brown, violet, deep
yellow, or white (these, it will be recollected,
are all the different shades which the blood
presents on coagulating) ; the same vegetation
may also be white externally and red internally,
or *vice versâ*.   Their degree of consistence is
also exceedingly variable ; some vegetations are
so hard and firm as to cut like fibrous tissue,
while others are so soft as to flatten like so
much tallow under the pressure of the finger.
But, what is particularly interesting for the so-
lution of the question of their origin, is, that
these vegetations not unfrequently present dif-
ferent degrees of consistence in different points :
in some the blood is still fluid, in others, it is
coagulated, but the coagulum is soft and colour-
ed ; a little farther on, the colouring matter dis-
appears, and the fibrine alone remains ; and this,
in its turn, becomes organized, or else degene-
rates into a soft pulpy mass.

Vegetations of the heart, as regards their
connexion with that viscus, may be divided into

three classes : those of the first are simply in
contact with the surface on which they are laid,
and such is the state of every vegetation at its
commencement ; those of the second adhere to
the heart either by simple fibrinous prolongations
that extend into the meshes of the parietes, or
by these prolongations become organized and
incorporated with the substance of the heart
itself ; lastly, those of the third class, after
having been adherent to the surface of the
heart, are subsequently detached, and become
loose and unattached as they were at the first
period of their formation. I admit this last
class, in order to account for those cases, where
vegetations of various forms and sizes have been
found floating loose, and totally unconnected
with the heart, but bearing on their surface a
number of filaments which appeared as if they
had been torn across. It is highly probable that
these filaments had, previously to their being
ruptured, served to attach the vegetation to the
surface on which it was originally formed. The
older anatomists were of opinion that fibrinous
concretions, when thus unattached to the walls of
the heart, might obstruct one of its orifices, and
thus suddenly cause the most fatal consequences:
the modern doctrine, while it denies the possi-
bility of such concretions being formed in the
heart during life, as a necessary consequence re-

jects the idea of apprehending danger from such a source. I am, however, disposed to think that in this instance the old opinion will be found the more correct of the two.

The causes which influence the formation of vegetations in the heart are not always easily appreciated; in general, however, they may be found either in the blood itself or in the heart.

The blood may become so modified as to have a constant tendency to coagulate in the interior of the heart, whenever the circulation experiences the least impediment, or even independently of any such impediment; this will appear less surprising, when we recollect that the heart does not wholly discharge its cavities at each contraction, but that a certain proportion of blood remains behind, and is (as it were) filtered through the meshes of the network which lines the internal surface of each of the heart's cavities. Certain morbid conditions of the heart may likewise favour the formation of these coagula, by impeding the free passage of the blood through its cavities. Thus, any alteration in the thickness of the parietes, the dimensions of the cavities, or the structure of the orifices, must necessarily produce a greater or less degree of stagnation of blood in the heart, and consequently afford a greater facility for its coagulation. In like manner, if the in-

ternal membrane be irritated, and in conse-
quence of that irritation throws out a coating of
lymph, which renders its surface rugged and
uneven, the blood, in passing over the uneven
surface, will have a constant tendency to form
depositions on it, as it does in the arteries, when
their internal membrane has lost its natural po-
lish. The explanation of this fact on mechani-
cal principles is, perhaps, not altogether satis-
factory ; no doubt, however, can be entertained
of the fact, that wherever the lining membrane
of the sanguiferous system has been irritated
and lost its natural polish, it sooner or later
becomes coated with a layer of coagulated
blood. Whether the irritated part acts on the
blood mechanically or vitally, is in the present
state of our knowledge difficult to determine ;
in the latter supposition, there is, however, no-
thing more surprising, than in that singular mo-
dification of the blood, termed its buffy coat,
which we so constantly observe in cases of pleu-
ritis and inflammation of the joints.

CHAPTER VI.

Lesions of the Innervation of the Heart.

As the diseases of this class do not depend
on any alteration of structure cognizable to our

senses, we must be contented with simply de-
tailing the results of observation and experience,
and shewing how, independently of any structu-
ral alteration of the organ, its functions may be
so deranged as to produce many of the same
symptoms, and, in some cases, give rise to the
same fatal consequences, as result from the dif-
ferent structural alterations enumerated in the
preceding chapters.

The heart may present unusual phenomena
either in its contractility, or in its sensibility,
which cannot be accounted for by any apprecia-
ble alteration in its organization : these pheno-
mena we refer, in the present state of our phy-
siological knowledge, to some derangement of
that portion of the nervous influence which di-
rects and regulates the action of the heart, as it
does of every other part of the body.

There are certain individuals who at inter-
vals experience sensations of acute pain, or of
numbness and weight in the region of the heart;
these sensations spread over the thorax, along
the neck, the arms, especially the left, and some-
times along the course of the spinal nerves,
and not unfrequently alternate with other pains
seated in different parts of the body. I have
seen them in one woman alternate with tic
douloureux, and in another succeed to intense
headach, and in their turn be succeeded by

spasmodic contractions of the muscles in some parts of the body, loss of sensibility in others, globus hystericus, &c.

This modification of the sensibility of the heart may either exist alone, or be accompanied by palpitations and dyspnœa. I once saw a case in which the latter symptom was so severe as to produce death. A woman was admitted into *La Charité* with diarrhœa and fever, who had had before her admission repeated attacks of acute pain in the region of the heart, accompanied by palpitations and dyspnœa. A few days after her admission she was suddenly seized with most excruciating pain in the heart, which beat with extreme violence, and was audible all over the chest ; the pulse was irregular, the respiration became more and more laborious, and she died in a few hours after the attack, apparently in a state of asphyxia. On dissection, a few tubercles were found in the lungs, but neither the heart nor its appendages presented the slightest vestige of disease.

This single case is of itself sufficient to establish the fact, that pain in the region of the præcordia, accompanied by palpitations and dyspœna, or, in other words, *angina pectoris* (as this group of symptoms has been named) may exist independently of any appreciable alteration in the organization of the heart. Not unfrequent-

ly, however, this affection supervenes during the progress of organic diseases of the heart ; and I am inclined to think that in some cases it precedes the organic lesion, which, if my view of the subject be correct, should then be regarded as its consequence, not as its cause. The theory of angina pectoris resulting from ossification of the coronary arteries is altogether unsupported by facts. Is there any more reality in the supposition of some connexion subsisting between this affection and the white spots which are sometimes found on the surface of the heart ?

It will readily be admitted that a simple modification of the nervous influence, independently of any organic alteration, may so derange the heart's action as to cause palpitations ; for, who has not felt his heart palpitate under a strong mental excitement? These nervous palpitations occur principally in three general conditions of the economy, which it is important to distinguish carefully, as each requires a different plan of treatment.

The first of these conditions is a state of plethora, which causes the heart to beat with too much force, just as it produces vertigo, dizziness, &c. Low diet and copious venesection are here indicated.

The second of these conditions is a state of anæmia. Palpitations, accompanied by more

or less of dyspnœa, are a frequent source of un-
easiness to invalids who have been submitted to
too severe a regimen, or kept too long on low
diet : in all such cases, these symptoms are in-
variably relieved by the use of a more generous
diet, which, we may suppose, acts by replenish-
ing the blood, and invigorating the system. An
analogous case to the preceding is that of ani-
mals falling into convulsions from excessive
hæmorrhage. But there are likewise certain
individuals who have neither been kept on
too low diet, nor bled to excess, but who ha-
bitually and constitutionally *make less blood than
others,* and are constantly subject to palpitations
and dyspnœa connected with the anæmic state
of their system. In such cases, shall we attempt
to remove the palpitations by blood-letting, on
the hypothesis of relieving a local plethora of
the heart, of the existence of which we have no
proof whatever ; or shall we not rather fulfil the
evident indication of restoring the balance of
the system by endeavouring to increase the ab-
solute quantity of the blood, or the relative
proportion of its fibrine and colouring matter ?
Certain it is, that under the treatment calculated
to fulfil the latter indication, we see those pal-
pitations disappear, which would infallibly have
been aggravated by venesection and low diet.

Lastly, the third condition of the economy,

which we have said is often accompanied by palpitations, does not depend either on an excess or deficiency of blood, for that fluid appears to exist in its due proportion, but on some primitive alteration in the action of the nervous centres themselves. In some cases of this kind, the palpitations are the only symptoms of the morbid state of the nervous system ; in others, they are only one of the derangements in which almost every organ in the body more or less participates. Let us take, for example, a young hysterical girl, in whom the most extraordinary derangements in all the functions succeed each other with the greatest rapidity. If we bleed her, we neither diminish the palpitations nor alleviate the other symptoms of her complaint. If we give her tonics, our success is no better. What then remains for us to do, but to employ such means, whether medical or moral, as act neither by debilitating nor yet by strengthening the system, but by substituting a new modification of the nervous system in the place of the old one. In this way, I conceive, may be explained the efficacy of matrimony in at once removing a whole train of morbid phenomena, which had been combated in vain by different articles from the Materia Medica. I do not so much allude to the physical effects of marriage, as to the moral influence it exerts on

the mind of the young woman, by the various emotions it excites, and by the complete revolution it works in all her ideas, habits, and pursuits.

Thus, then, there is a large class of affections of the heart of which morbid anatomy shews us little else than the termination. That which we find in the dead body is not always what has been the first cause of the disease; it is not the hypertrophy of the heart which originally produced the palpitations, but, in many cases, the palpitations which produced the hypertrophy. Hence the evident conclusion, which cannot be too often impressed on the mind of the morbid anatomist, namely, that the treatment of the disease, at least at its commencement, is not to be regulated so much by the morbid appearances found after death, as by the state of the system which preceded and favoured the developement of those morbid appearances.

SECTION II.

DISEASES OF THE ARTERIES.

CHAPTER I.

LESIONS OF CIRCULATION.

WE frequently find in the dead body the internal membrane of the arteries dyed a bright red colour : whence comes this peculiar appearance ?   Is it the result of inflammation, or is it merely a post mortem alteration ?   The same arguments that were adduced at the commencement of the last section, when the same question was started with respect to a similar appearance in the heart, are equally applicable in the present instance.   Whenever a body is opened in an incipient state of putrefaction, the internal coat of the arteries is invariably red ; and in proportion as the quantity of blood is considerable, and it evinces but little disposition to coagulate, this redness is more marked, and

makes its appearance at a shorter period after death. In some cases, where the blood only covers certain points of an artery, the redness is confined to those points; and lastly, it may be produced at pleasure by enclosing some blood in an artery, tying both ends, and allowing it to remain so for some time. These facts are amply sufficient to prove that the uniform redness which is so often observed in the inner arterial coat may be produced by the simple circumstance of the blood soaking through, and imparting its colour to it.

But then, on the other hand, there are some cases, where the same redness is observed on the arterial surface in bodies which do not yet betray the slightest symptom of putrefaction. It is found, too, under the most different circumstances, whether the artery be empty, or full, whether the blood be fluid or coagulated, and whether the coagulum be deprived of its colouring matter or not. Several of the dissections recorded by MM. Bouillaud and Bertin, in which they found the internal surface of the aorta red, were made within twenty-four hours after death, and during the cold season.

Having premised these observations, we may now proceed to consider whether this red stained appearance is invariably a *post mortem* alteration, or whether it is in some cases produced during

life. In the year 1825 a violent distemper pre-
vailed among the horses at Paris and in some of
the provinces : the most general symptoms were
those of gastro-intestinal irritation, but, with
very few exceptions, the thoracic viscera were
likewise implicated, the breathing being greatly
affected, although there was not much cough.
During this epidemic, M. Dupuy and I dissected
a number of horses at the slaughter-houses at
Montfaucon : the animals were scarcely slaugh-
tered when we proceeded to examine them, and
in many cases the internal membrane of the
heart and aorta presented a bright red colour.
At the same time, M. Bouley, jun., one of our
most distinguished veterinaries, examined more
than fifty horses who died of the same epidemic :
his dissections were always made within from
half an hour to three hours after the death of
the animal, and in almost every instance he
found the internal membrane of the heart and
aorta of a bright scarlet, or purple colour.
On the other hand, MM. Rigot and Trousseau,
who likewise opened a great number of horses,
state that they never found any appearance of
redness in the heart or arteries, when the dis-
section was made shortly after death, but that
they always found it when the dissection was
deferred for several hours. This difference in
the result of our dissections is to be accounted

for by the circumstance of our researches hav-
ing been made at different periods, mine during
the year 1825, theirs in 1826, after the distem-
per had ceased. There is therefore nothing ex-
traordinary in the different results we obtained;
and it appears to me, that the very circum-
stance of the redness of the heart and arteries,
so constantly observed during the first epidemic,
not being observed after it had ceased, affords
an additional reason for supposing that it was
produced by a morbid condition of the part.
As to the nature of that morbid condition, I
think it highly probable that it was an irritation
of the coats of the arteries ; but I am well aware,
it may be otherwise explained by supposing that
the blood was so modified during the lifetime of
the animal, that its colouring matter separated
from its fibrine, and stained the parietes of the
heart and arteries. But then we should take in-
to account, that these horses during their illness
presented decided symptoms of disease in the
thoracic viscera, and as no morbid appearance
was found in the lungs, we have nothing to at-
tribute those symptoms to but the affection of
the heart and large vessels, characterized, 1.
by the uniform red colour of their internal
membrane ; 2. by a remarkable degree of soften-
ing in the muscular structure of the heart ; and,

3. by inflammation of the pericardium, and effusions of different kinds into its cavity.

From these facts I conclude that the uniform redness of the internal coat of arteries may be in some cases the result of inflammation. In one of the cases recorded by M. Bouillaud, the internal membrane is described as being covered in those parts where it was red, by a thin layer of albuminous matter: surely this is tolerable evidence of the existence of inflammation.

The red colour thus produced differs in no respect from that which is developed after death. Several experiments have recently been made by M. Gendrin,* with the view of ascertaining whether the colour produced in the arterial coats by irritating them artificially was invariably the same uniform red stain, or whether they may not in some cases present appearances more analogous to those produced by irritation in other parts of the body.

When he used a moderate degree of compression on an artery, he found, at the end of twelve or fifteen hours, the internal coat of a pale red, the middle of a reddish yellow, and the cellular sheath minutely injected : both above and below the part compressed, the outer and middle coat were uniformly reddish and infiltrated

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* *Histoire Anatomique des Inflammations*, tom. ii. p. 9.

with serum, and the inner coat was of a brilliant red colour. After a lapse of thirty or forty hours the middle coat became evidently softened and injected, and immediately above and below the compression the external and middle coats seemed confounded into a red flesh-like substance infiltrated with blood and serum.

In the second experiment, he injected some irritating substance into a portion of artery included between two ligatures, and from which the blood had been previously washed out; the internal membrane, after a few hours, was found to have acquired a bright violet colour. Now, in this case, it is evident that the membrane could not have been stained by the blood, for at the commencement of the experiment that fluid was all washed away.

Lastly, if we wash an artery, slit it open, and expose its internal surface to the air, its inner membrane soon turns red, and the subjacent coats acquire a bright vermilion colour.

From these facts it follows, that we can produce artificially in the arteries of living animals, the same varieties of colour as we sometimes find in the arteries after death. There is, however, this important difference, that when the redness of the arteries is produced by artificial irritation, it is accompanied by other alterations of tissue, such as softening, serous or purulent

infiltration, &c. ; whereas in almost all the cases where the arteries have been found of a red colour in the human subject, the change of colour was unaccompanied by any other morbid alteration.   I think we are therefore warranted in concluding that but little value can be attached to the red colour, as a mark of arterial disease, unless where it is acompanied by some other morbid alteration.

CHAPTER II.

LESIONS OF NUTRITION.

THE different coats of which the arterial tube is composed, are not all altered in their nutrition in the same manner, or at the same time. It is therefore necessary to consider them apart, and to study in each tissue the alterations of nutrition to which it is liable.

The internal membrane presents very few alterations.   It sometimes loses its tenuity and natural transparency ; this alteration may be confined to a few isolated points, producing the appearance of white spots dotting over the internal surface, or may extend over a considerable surface.   The thickening and opacity of this membrane is, however, in many cases only ap-

parent, and is really owing to an albuminous exudation developed in its subjacent cellular tissue.

Another alteration of nutrition to which the internal membrane is liable is softening ; it is sometimes found so friable, as to be reduced to a pulpy mass by the slightest scraping with the scalpel.

Lastly, the internal membrane is subject to ulceration. The ulcers of this membrane are generally round ; sometimes only one is to be found in the whole arterial system, in other cases the aorta is almost riddled with them ; this, however, rarely happens unless when they co-exist with other alterations in the subjacent tissues, such as ossification, &c. I recollect, however, having seen one case in which the internal surface of the aorta was overspread with a number of round superficial ulcers, about the size of six-pences. The margins of some were marked by a brown or rose-coloured zone, and their bottom was formed by the fibrous coat which appeared free from disease throughout.

The middle coat is more frequently altered in its structure than the internal, and its alterations are much more varied. It sometimes becomes soft and friable, is readily torn by the slightest effort, and loses its natural elasticity ; hence arise serious modifications in the functions of the artery, and likewise of the heart, if

the loss of elasticity extends over an extensive surface.

Hypertrophy is another alteration to which the middle coat is often liable. When in this state, its natural organization becomes much more apparent : the yellow fibrous tissue of which it is composed, becomes as evident in the human subject as it is in the horse, but never does it present any trace of muscular fibre, even in the most extreme cases of hypertrophy. This alteration may extend over the whole surface of an artery, or may be confined to certain isolated points, which then form irregular protuberances on the internal surface of the artery.

This coat may likewise fall into a state of atrophy, in which case it appears as if about to return to cellular tissue. The whole arterial tunic becomes much thinner, and resembles the tunic of veins, and the artery too loses its elasticity, and collapses when divided.

Although the fibrous tissue of the arteries is never converted into muscular tissue, there are other transformations which it not unfrequently undergoes. In some cases its fibres acquire a considerable degree of rigidity, and are gradually transformed into cartilaginous or even osseous rings, which embrace the whole circumference of the artery. This transformation is rarely met with in the aorta, but occurs not un-

frequently in the arteries which mediately arise from it : I have seen it, for instance, exceedingly well marked in the femoral artery, the parietes of which presented a series of cartilaginous and osseous circles, and bore a striking resemblance to the parietes of the trachea in birds.

Lastly, the middle coat is, like the inner one, subject to ulceration.

The external or cellular membrane is liable to few alterations. It often remains intact when both the other coats are extensively diseased, and, when they are ruptured, it frequently remains to sustain the pressure of the column of blood with which it then comes into immediate contact. Sometimes, however, it participates in the disease of the other coats, and, like them, is ruptured, and allows the blood to escape.

The several alterations of nutrition just enumerated do not merely change the appearance and properties of the particular coat which they affect, but likewise generally produce an evident alteration in the dimensions of the artery. In this way the caliber of an artery may be either increased, diminished, or totally obliterated. I shall consider each of these alterations separately.

I. *Dilatation of the Arteries.*

An artery may be dilated in its entire circumference, or in only a part of it.

The dilatation of the entire circumference is the more frequent case of the two : it may embrace a considerable extent of artery, as for instance, the whole of the aorta, or may be confined to one or more points where it forms so many circular bulges.

The dilatation of an artery in a part only of its circumference, is so rare an occurrence that some authors have questioned its reality ; the fact, however, is placed beyond dispute, for on more occasions than one I have been able to trace distinctly the three arterial coats passing over the walls of a sac which seemed as if appended to the artery with the cavity of which it communicated.

This dilatation of an artery without rupture of any of its coats has received from authors the name of *true aneurism.*

When an artery is dilated, its parietes, though not ruptured, may present various alterations. In some cases they are much thinner than natural, the middle coat loses its wonted elasticity, and the arteries then yield like veins to the distending force of the blood. In other cases, again, the arterial parietes are in a state

of hypertrophy, thus furnishing an analogous case to the dilatations of the stomach and heart, which are often accompanied with an increase of thickness in their parietes.

In the preceding cases of dilatation, there has been no rupture of any of the arterial coats; but there is another form of the disease, the false aneurism of authors, in which the dilatation is accompanied by rupture of one or more of those coats. When the internal and middle coats are ruptured, the blood comes into immediate contact with the cellular sheath, which it gradually distends and dilates into the form of a pouch, known by the name of the aneurismal sac.

The parietes of the sac are generally much thicker than the cellular sheath of which they were originally formed, in consequence of the surrounding cellular tissue becoming gradually so condensed as to form an additional envelope. The interior of the sac is more or less filled with coagulated blood, the coagula being arranged in concentric layers, of which the outer ones in some cases acquire such a degree of density as to be confounded with the parietes of the sac. There is a constant process of irritation kept up all round the external surface of the sac, in consequence of which adhesions are formed that unite it more or less firmly to the surrounding parts. These parts are variously affected :

sometimes they are mechanically compressed,
or displaced, by the pressure of the aneurism,
or even worn away by its pulsations, and in
some cases they undergo a process of irritation
which terminates in their ulceration and de-
struction.   Thus, when the aorta is the seat of
the aneurism, the tumour may make its way
through the sternum or the ribs, and protrude
externally ; M. Lenoble lately communicated to
the *Académie de Medecine* the particulars of a
case in which the aneurism, after destroying
the ribs, came in contact with the scapula, and
displaced it very considerably.   It may also at-
tack the bodies of the vertebræ, eat its way
through the spinal canal, and by pressing on the
spinal cord, produce sudden paralysis : it is re-
markable that the intervertebral cartilages often
remain uninjured in these cases.   Sometimes
the aneurism presses against the organs con-
tained in the thorax or abdomen, and in this
way may compress or perforate the pulmonary
artery, the superior cava, the thoracic duct, the
œsophagus, the trachea, the bronchial tubes, the
lungs, the stomach, or some convolution of the
intestines.   It may burst either into the pleura
or into the peritoneum.   The veins which run
in the neighbourhood of aneurisms are often
compressed, or even obliterated, the nerves are
flattened like ribands, and the muscles are

wasted in a remarkable degree. When the tumour is in contact with a bone, the periosteum is in some cases destroyed, and the bone, thus deprived of its fibrous envelope, becomes carious; in other cases again, the periosteum is remarkably thickened, and occasionally it secretes an osseous substance which surrounds the tumour and forms an envelope to it.

In general, the irritation which is created in the parts around the sac sooner or later attacks the sac itself, and not unfrequently terminates in its perforation. A hæmorrhage then ensues, which in some cases only ceases with the life of the individual, and in others, is arrested either by the natural conformation of the part, as when the blood flows into the pericardium, or by some accidental circumstance, as when the adhesions which had been formed round the sac form a second envelope, which prevents the hæmorrhage proceeding any farther. The perforation of the sac is not necessarily followed in every case by hæmorrhage, for it often happens that some organ in contact with the sac supplies the place of that portion of its parietes which had been destroyed, and thus prevents the escape of its contents.

All aneurisms do not necessarily terminate in the manner described in the last paragraph ; on the contrary, a spontaneous cure is sometimes effected by one of the processes described in the four cases following.

Case I.—The coagulum is spontaneously absorbed, the sac gradually contracts, and there remains only a small tumour, which may even eventually disappear altogether.

Case II.—The sac may exert such a degree of pressure on that part of the artery immediately above it, as to cause its obliteration, in consequence of which the sac disappears, as in those cases where the surgeon produces the obliteration of the artery by applying a ligature round it.

Case III.—The parietes of the sac may be destroyed by gangrene, and the artery subsequently become obliterated.

Case IV.—Several instances have been recorded of abscesses in the neighbourhood of the sac giving rise to an adhesive inflammation in the interior of the artery, the consequence of which was, as in the preceding cases, the obliteration of the artery and cure of the aneurism.

In the species of aneurism last described (the false aneurism of authors) the inner and middle coats are first ruptured, and the bursting of the outer coat follows, if at all, at some subsequent period. But there is yet another case, in which all three coats give way together; the artery is thus suddenly perforated, and no sac is formed. I saw a case of this description in a patient affected with peritonitis, who died almost sud-

denly in a fit of syncope. On dissection, an enormous effusion of blood was found in the abdomen. One of the iliac arteries presented an aperture nearly as large as a six-pence, which seemed as if the piece were cut out. In another case of sudden death, I found a similar perforation in the splenic artery ; it has likewise been observed in the hepatic artery. In all these cases, the artery was perforated as if it had been wounded by a sharp instrument, and with the same results. We are not, however, to suppose that all wounds of arteries from external injuries are followed by such fatal consequences. The following is a brief summary of the different cases in which a spontaneous cure may be effected.

Case I.—When the wound is simply a punctured one, made by a small instrument, a coagulum forms in it, which though at first it acts merely as a mechanical stopper, subsequently becomes organized, and is transformed into a tissue in every respect similar to the arterial.

Case II.—When the incision of the artery is parallel to its axis. The same phenomena are observed as in the preceding case.

Case III.—When the incision of the artery is made transversely to its axis. In this case, very different phenomena result according as the cellular sheath has been removed or not.

When it has been removed, as is sometimes done in experiments on animals, the hæmorrhage only ceases with the life of the animal. On the other hand, when the artery has not been denuded of its cellular coat, it arrests the blood in its meshes, and thus favours the formation of a coagulum ; the hæmorrhage ceases, and the coagulum in some instances becomes organized, and is transformed into a true arterial tissue ; more commonly, however, the coagulum does not become organized, but at the end of a certain time is detached, and a fresh hæmorrhage ensues.

Case IV.—When the artery is perfectly divided, if the cellular sheath has been dissected away, the hæmorrhage which ensues is necessarily mortal ; but if the sheath has not been removed, the internal and middle coats retract, so as to leave the cellular coat projecting several lines beyond them ; and the meshes of this cellular coat serving to entangle the blood, a coagulum is thus formed, which extends along the interior of the artery as far as the next collateral branch, and eventually that portion of the vessel is converted into an impermeable cord.

The last variety of perforation which remains for us to consider is, where the solution of continuity, instead of passing simultaneously

through all the coats, or passing in succession from the inner to the middle, and from the middle to the outer coat, takes an opposite rout and proceeds from without inwards, until it reaches the inner membrane, which (it is stated by authors) not unfrequently forms a hernia through the outer tunics.

II. *Narrowing of the Arteries.*

This alteration may be either congenital or the effect of disease. The aorta may be smaller than natural throughout its whole extent, or the contraction may be confined to a certain portion. Contraction of the abdominal aorta is more frequent than that of the thoracic portion ; and in some cases the contraction of the former part co-exists with the dilatation of the latter. Congenital contraction of the aorta is generally united with extreme thinness of its parietes. In some cases, the caliber of the abdominal aorta is so diminished as hardly to equal that of the external iliac artery.

The aorta has sometimes been found contracted in one point, and retaining its natural caliber both above and below the point thus constricted. A remarkable case of this description is recorded in the 2d vol. of the *Journal de Desault*. Whilst injecting the body of a woman fifty years of age, he found the aorta, immedi-

ately below where it gives off the left subclavian, reduced to the diameter of a goose-quill. From its origin at the heart to the commencement of its arch it presented its natural dimensions ; the arch itself was slightly dilated, and the arteries which arose from it were nearly twice as large as usual, and effectually kept up a collateral circulation. The membranes at the contracted part were not thicker than natural.

Another case of partial contraction of the aorta nearly similar to the preceding is minutely described by M. Reynaud in the 1st vol. of the *Journal Hebdomadaire de Medecine.*

In such cases as these, where there is no appearance of previous disease, it is difficult to decide whether the contraction be congenital or accidental ; the difficulty, however, vanishes when the coats are found thickened, or when the capacity of the artery is diminished by the presence of ossifications, or other morbid productions. The contraction produced in this way is sometimes so considerable as to reduce the caliber of the aorta to that of the femoral artery. I recollect seeing a case in which one of the external iliacs was almost completely transformed into an osseous canal ; and its capacity so diminished as with difficulty to admit the introduction of a moderate size probe.

III.   *Obliteration of the Arteries.*

It is not very uncommon to find arteries of the second or third order obliterated, and in some few cases the aorta itself has been found impermeable.

The obliteration of an artery may be effected in various ways ; thus, in some cases we find only a ligamentous cord, such as is formed in the adult by the umbilical artery ; in others, the point where the artery is obliterated is occupied by coagula of fibrine, more or less organized, adhering firmly to the parietes of the vessel, and sometimes incorporated with them ; whilst in other cases again, the obliteration results from the complete obstruction of the cavity of the artery by osseous concretions.

The first species of obliteration has been observed twice in the aorta ; once,* in a boy fourteen years old, in whom the aorta was completely obliterated near its junction with the ductus arteriosus, and a second time † in a boy of the same age, whose aorta was obliterated for five or six lines immediately below the origin of the left subclavian.   In both these indivi-

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* Sir A. Cooper *On the Ligature of the Aorta.*
† *Journal de Corvisart, &c.* tom. XXXIII.

duals there were present all the symptoms of organic disease of the heart, and in both the circulation was kept up by the aid of collateral arteries considerably dilated. There was this difference, however, that in the first case the ductus arteriosus was converted as usual into a ligamentous cord, whilst in the second it was permeable and even considerably dilated.

The second species of obliteration has been more frequently observed than the first, but no instance of it has as yet been seen in the aorta. It has been repeatedly found in the arteries of the lower extremities coinciding with the disease known by the name of *gangræna senilis,* and it is reasonable to conclude that in these cases the obliteration of the arteries is the cause of the gangrene : this much at least is certain, that it is not the effect, for in a patient who died of gangrene of one foot, and in whom all the arteries of that limb were completely obstructed by solid coagula of fibrine, the commencement of a similar obstruction was found in the arteries of the opposite limb, although not a sign of gangrene was observable in it. It appears to me highly probable that if this individual had lived for some time longer, the arteries of the sound limb would have become more and more obstructed, and that the foot of that side would have then become gangrenous also.

An example of the third species of oblitera-
tion has been published by Dr. Goodisson of
Dublin. Near the origin of the inferior mesen-
teric, a hard tumour was felt in the aorta, which,
on dissection, was found to consist of a dense
fibrinous concretion, compared by the author to
the structure of the gizzard in birds ; this tu-
mour completely blocked up the narrow passage
which was left by an osseous substance that pro-
jected inwards from the parietes, which were
themselves extensively ossified. The common
iliac artery and a portion of the external iliac
of the left side were completely obliterated, as
was also the commencement of the right com-
mon iliac. Notwithstanding all these oblitera-
tions, the circulation was kept up by collateral
branches, and the lower extremities were not
in the least wasted.

Beclard was of opinion that the obliteration
of the arteries by the ossification of their pari-
etes might be one of the causes of *gangræna
senilis.*

CHAPTER III.

CONGENITAL LESIONS OF NUTRITION.

I SHALL not at present enter into a detailed account of the several varieties which the arteries may present in their form and distribution, but shall content myself with enumerating those which materially influence the course of the blood, and have consequently most importance in a medical point of view.

Two aortas sometimes arise from the left ventricle, or, as more frequently happens, the aorta is single at its origin, but divides into two, almost immediately on its leaving the heart. Of the two trunks thus formed, one terminates in the innominata, the other, after giving off the left carotid and subclavian, goes to form the descending aorta.

The aorta may arise from both ventricles together; this malformation is most frequently seen in one of the following cases : 1. when the septum of the ventricles is wanting ; 2. when it deviates from its natural situation ; and, 3. when there exists an accidental passage from the right ventricle into the aorta.

Lastly, the aorta sometimes arises from the right ventricle, and it is very remarkable that the walls of that ventricle are always much thicker in such cases.

The aorta is liable to some varieties of structure at its origin : in some cases it has only two valves, which are then very large ; in others, it has four, or even five valves.

The pulmonary artery presents as many varieties in its origin as the aorta. Sometimes it arises from the left ventricle, and sometimes it is given off by the aorta, or even by the sub-clavian artery. In other cases, its natural orifice has been found obliterated, but then the ductus arteriosus and foramen ovale both remained per-vious. The last variety I shall enumerate is where there is no trace of any pulmonary artery, and the lungs receive all their blood from the bronchial arteries furnished by the aorta.

The pulmonary artery may be regular at its origin and anomalous in its course and distribu-tion. Thus, it has been found in fœtuses pass-ing directly to the lungs, without at all commu-nicating with the ductus arteriosus, which arose distinctly from the right ventricle. In other instances, it has been known to give off the aorta descendens.

Tiedemann's beautiful plates give an admi-rable representation of the different varieties in the origin of the arteries which usually arise from the arch of the aorta ; and the reader will find all the information he can desire on this subject in Meckel's Manual of Anatomy.

CHAPTER IV.

LESIONS OF SECRETION.

WHEN we excite an artificial irritation in the artery of an animal by compressing it strongly, or by introducing into it a solid substance or irritating fluid, (taking care in the latter case to confine it by ligatures,) its parietes soon present a variety of morbid alterations.* They become injected, swollen, and softened, and at the same time are infiltrated by a clear serous fluid ; their internal surface is coated by a layer of a plastic substance, and collections of pus form either between the coats, or in the interior of the vessel. If the artery continues full of blood during the experiment, that fluid coagulates, and is altered in a variety of ways by its mixture with the fluids which the internal membrane exhales.

These different appearances have likewise been observed in the human subject. M. Bouillaud found the internal surface of the aorta lined by a perfect false membrane, and when the membrane was removed the subjacent surface presented a bright red colour. I once found the

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* Gendrin, *Histoire Anatomique des Inflammations.*

inner membrane of the aorta raised by five or six small abscesses, each about the size of a nut, and situated between the internal and middle coats : the pus contained in these abscesses had the usual appearance of phlegmonous pus ; there was no sign of redness in any of the coats. Pus is likewise occasionally met with in the interior of the arteries, where it is usually mixed with the blood, the appearance of which it materially alters ; it is also found without any admixture of blood. In an individual in whom several of the pulmonary lobules appeared in a state of puru-lent infiltration, I ascertained satisfactorily that the appearance was produced by a number of the minute branches of the pulmonary artery being filled with pus.

There is another morbid secretion which is still more frequently found than pus under the internal coat of arteries ; I allude to that pecu-liar substance which has long been described under the name of *atheromatous* matter. It has the consistence of suet, feels greasy to the touch, and when broken down under the finger gives the sensation of minute gritty points thinly scattered through a fatty substance. In other cases the saline matter is more abundant, and exceeds in quantity the fatty substance, or is even found without any of that substance, in which case it forms one or more hard concre-

tions that have a much stronger resemblance to mortar than to bone. These concretions present considerable variety in their physical properties, and, as they constitute one of the most frequent alterations to which the arteries are liable, I shall enter somewhat minutely into the history of their developement.

Calcareous concretions are so constantly found in the arteries at an advanced period of life, that Bichat computed that out of ten persons over sixty years of age, seven would be found with these concretions. According to Baillie, it is more common to find the arteries ossified than not, in old age.* Neither are the other periods of life exempt from this affection : thus, Young found the temporal artery ossified in an infant of fifteen months, and Doctor Wilson saw the aorta ossified at the age of three years. I myself observed several ossiform plates in the aorta of a little girl only eight years old, and I have seen five or six instances of similar appearances in persons of from eighteen to twenty-four years of age ; lastly, I found an extensive ossification of the superior mesenteric in an individual not quite thirty.

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* There are, however, some individuals who arive at an extreme old age without their arteries becoming ossified, as I have myself ascertained by dissection.

I do not know of any instance of the internal membrane having been the seat of these calcareous concretions; but it is often detached from its connexions by them. We have already seen that the middle or fibrous coat sometimes undergoes a true osseous transformation, but that case should not be confounded with this which we are at present considering, where the bony matter is simply deposited between the internal and middle coats. The matter thus deposited originates either in the atheromatous matter already described, which it sometimes seems to take the place of, just as calcareous concretions in the lungs takes the place of tubercles; or in those white patches, the nature of which is as yet unknown, but which are apparently formed by a deposition of albuminous matter between the inner and middle coats; or, lastly, in cartilaginous patches, which seem only a more advanced stage of the preceding.

At the same time that these calcareous depositions are forming, the middle or fibrous coat undergoes the same alterations as occur in every tissue where a process of morbid secretion is going forward. In some cases, it becomes hypertrophied, and so contributes in part to the considerable thickening which the parietes of the artery in such cases not unfrequently present; in others, it becomes atrophied, and the

place which it occupied is taken up by the newly formed calcareous concretion. This latter case, namely the deposition of bony matter accompanied by atrophy of an adjacent membrane, has in this, as in other instances, been often mistaken for the transformation of that membrane into bone.

The appearance of these ossiform concretions is exceedingly variable. Sometimes they appear in the form of minute grains scattered over the internal surface of the vessel, and sometimes they form irregular plates of various extents and depths : in some cases, the artery is so incrusted with them, as to be converted into an inflexible tube ; in other cases again, the artery, when pressed under the finger, gives the sensation of containing a number of small hard bodies playing on each other, and as if jointed together.

These concretions may not alter in the least the internal form and dimensions of the vessel, or they may project so considerably as almost to obliterate its cavity. Beclard was of opinion that they might in this way produce gangræna senilis. Another hypothesis, which, though not proved, may yet turn out to be correct, is, that they may be detached from their connexions and fall into the cavity of the artery, from whence they may be carried in the blood into

arteries of smaller caliber, and effectually plug
them up.

It has been proved by chemical analysis that
these concretions are composed of phosphate
of lime united with a certain proportion of ani-
mal matter. The following proportions have
been assigned by Brande :

Phosphate of Lime, ...	65.5
Animal Matter, ...	34.5
	100.0

If we compare the different arteries with re-
gard to the frequency of their ossification, we
shall find that the aorta is the most liable of any
to this alteration. Every one of the branches
which arise from it have likewise been found
ossified. Thus, the coronary arteries are fre-
quently so, not only in their trunks, but also in
their subdivisions. The ossification of these
arteries has been assigned as the cause of *angina
pectoris*, of atrophy of the heart, and of certain
cases of asthma and of sudden death. This
hypothesis, for so I must call it, has not been
confirmed by experience. The large vessels
which arise from the arch of the aorta not un-
frequently present at their origin a sort of bony
ridge which projects into their interior, and is
perhaps one of the reasons which causes the

difference of the pulse in the right and left arm
so often felt in old men.   It is also very common
to find in old people the cerebral arteries studded
with cartilaginous and osseous plates. M. Bouil-
laud has lately shewn, in an interesting essay, the
connexion which exists in several cases between
cerebral hæmorrhage and the ossification of the
arteries which are distributed to the brain.
The different branches given off by the abdo-
minal aorta have not all the same tendency to
ossification ; thus, it is exceedingly common in
the splenic, while it is equally rare in the hepa-
tic and the coronary artery of the stomach.
At the origin of the common iliacs, there is often
a bony ridge similar to that which we have al-
ready noticed as not unfrequently obstructing
the carotid and subclavian arteries at their ori-
gins.   The only instance I am acquainted with
of the principal branches of the hypogastric
artery being ossified is that recorded by Haller,
(*Opuse. Patholog. Obs.* 59.)   The arteries of
the lower extremities are not unfrequently the
seat of these calcareous depositions : every phy-
sician who has been in the habit of feeling the
pulse of old persons, must have repeatedly ob-
served the ossification of the radial artery.

The greater number of the morbid secretions
we have enumerated have likewise been found in
the pulmonary artery, but much more rarely

than in the aorta and its branches. I have oc-
casionally seen the internal surface of the pul-
monary artery studded with a number of white
patches, slightly elevated. In one instance I
found two or three small plates of cartilage, and
in another, a small plate of bone that caused a
slight elevation of the internal membrane ; it
was situated near the bifurcation of the vessel.
Ossification of the pulmonary artery is, then, a
rare occurrence, but not an impossibility, as
Bichat pronounced it to be.

Ossification of the arteries, like most other
alterations of nutrition and secretion, cannot be
explained by an increase or diminution of the
sum of vitality distributed to the part affected,
or, in other words, by any variety or degree of
atony or of local irritation or inflammation. I
have already argued this point so fully in the
first volume, that it is unnecessary for me to
repeat the arguments here. Suffice it to say,
that all we know of the formation of these ossi-
fications is, that they are the result of a de-
rangement in the natural process of secretion
and nutrition. This, however, is only the first
step in our inquiry. We should next endeavour
to ascertain what are the causes of that de-
rangement, and when we have discovered them,
we may then consider the best means of coun-
teracting and combating them. On this subject,

I shall venture to offer an hypothesis.   Medical
practitioners have long remarked the co-exis-
tence or succession of three principal pheno-
mena in persons affected with gout ; namely,
hard concretions in the joints, depositions of
calcareous matter in the arteries, and gravel in
the urinary passages.   They have likewise ob-
served, that gouty subjects, as well as those af-
flicted with gravel, are generally persons who
have committed excesses at table, and made too
free a use of animal diet.   Moreover, within
these few years, M. Magendie has shewn, that
by feeding a carnivorous animal on substances
that contain little or no azote, his urine may be
deprived of the uric acid, and of the phosphate
of lime ; whence it follows, that if an individual
makes an excessive use of substances containing
much azote, his urine will necessarily have to
eliminate from the blood a proportionably great
quantity of uric acid and phosphate of lime.
But if the quantity of these salts becomes so great
that they cannot all be carried off by the urine,
we may suppose that other ways of elimination
may then be opened ; that the uric acid which
is found in gouty joints may be that supera-
bundant portion of it which the kidneys were
unable to eliminate ; and that the phosphate of
lime deposited in the arteries may likewise be
that portion which could not pass off from the

blood with the urine. By this hypothesis several phenomena are connected together, which at first sight, appeared to bear no relation to each other. There is phosphate of lime deposited in the arteries, and uric acid in the joints, at the same time, and for the same reason, namely, because there is an excessive formation of each in the blood. Before these local affections made their appearance, the blood had already undergone an alteration, and in consequence a general process of secretion was requisite to rid it of its superfluous ingredients. This tendency to establish a process of secretion, is always accompanied by an increased afflux of blood towards the seat of the secretion, and by an exaltation of its vitality; and in this way is produced the local irritation which, in a greater or less degree, precedes all morbid secretions. If this reasoning be admitted, it follows of course, that the irritation is itself only an effect, and so far from being regarded as the cause of the morbid secretions that are formed, should be considered as merely existing for the purpose of favouring the elimination of a morbid matter from the blood. When I reflect on the conclusion to which this argument has led me, I really feel surprised at thus finding myself involved in the antiquated doctrines of the humoral pathology. But, why should I on that account reject an

hypothesis which appears so satisfactorily to connect all the facts that have been observed; which embraces them all, symptoms, morbid appearances, and method of treatment; and which, I have no hesitation in affirming, gives a more satisfactory and more scientific explanation of these facts, than the hypothesis in vogue at the present day, which considers each of these alterations as the effect of an irritation purely local, and independent of any general or constitutional derangement.

CHAPTER V.

LESIONS OF THE INNERVATION OF THE ARTERIES.

THE arteries are, throughout the greater part of their subdivisions, surrounded with a net-work of nerves that are furnished by the great sympathetic, and appear to penetrate their coats. They probably receive some influence from these nerves in the state of health; and it is reasonable to suppose that, like all other parts to which nerves are distributed, they are sometimes diseased in consequence of a primitive modification of the nervous influence to which they are subjected. This supposition is, however, as yet unsupported by facts; and it is pos-

sible that the plexuses of nerves which sur-
round the arteries, may not be destined for the
use of the arteries themselves, but only accom-
pany them to their ultimate destination, in the
capillary system.

Laennec admitted the existence of neuralgia
of the arteries, and laid down as the symptoms
by which this affection was characterised, acute
pain along the course of the arteries, and an in-
crease in their pulsations with or without *bruit
de soufflet*.   He accounted for the violent pulsa-
tions and the peculiar sound by a spasm of the
arterial parietes.   Whether we admit the exist-
ence of spasmodic action in the arteries or not,
certain it is, that violent pulsations are some-
times felt along the course of the arteries, more
especially of the superior portion of the abdomi-
nal aorta, which continue from a few hours
to several days, and often recur at longer or
shorter intervals.   Morbid anatomy has not as
yet offered any explanation of these pulsations;
by some authors they have been attributed to
irritation and hyperæmia of the artery (*arteritis,*)
but this explanation is as much an hypothesis as
the spasm of Laennec.

A loud *bruit de soufflet* accompanying the
dilatation of the vessel is often heard in all the
principal arteries; in this case, too, morbid ana-
tomy has not as yet discovered any physical

alteration, either in the parietes of the arteries, in the heart, or in the blood itself, which can account for the production of this peculiar sound. It has most frequently been observed in individuals affected with hypertrophy of the heart; but I have myself heard it in persons whose heart presented not the slightest symptom of disease, either in the thickness of its parietes or in the capacity of its cavities.

There are, therefore, still many curious and interesting researches to make respecting the cause of these phenomena. Our present ignorance on the subject is one of the thousand proofs we have of the insufficiency of our morbid anatomy to account for all the phenomena of disease.

SECTION III.

DISEASES OF THE VEINS.

For a long period no other disease of the veins was known than that usually designated by the name of varix ; and even in this affection the nature of the pathological change was frequently mistaken. Towards the end of the last century, the celebrated Hunter found the veins in horses red, thickened, and filled with pus ; from that time, the attention of pathologists has been directed to the affections of these vessels, and at the present day all anatomists are agreed that the veins are liable to the same diseases as the other parts of the body.

M. Cruveilhier has recently instituted a set of ingenious experiments on those vessels, which have led him to the conclusion that, whenever a part of the body is so irritated as to exhibit the usual phenomena of inflammation, the venous tissue is the principal seat of these phenomena.

Diseases of the veins resemble the diseases of arteries in some respects, and differ from them in others. The veins never exhibit the

morbid alteration termed aneurism, because their coats all yield equally to any pressure to which they are submitted ; whereas in the arteries it is only the external coat which is susceptible of thus yielding : besides, the veins are not exposed to the same constant shock from the columns of blood that the arteries are ; but even though a vein were exposed to this same shock, the consequence would be, not a rupture of any of the coats, but a dilatation of them all. Whence is it that calcareous concretions are so rarely met with in the veins, while they are so common in the arteries ? I do not think that this difference can be accounted for solely by their difference of texture ; for the texture of the pulmonary artery is the same as that of the aorta, and the right side of the heart is organized precisely as the left ; and yet ossifications are incomparably more frequent in the aorta and left side of the heart than in the pulmonary artery and right side. The reason why the blood is more frequently coagulated and organized in the veins than in the arteries, is probably to be found in the difference of the circulation in these two orders of vessels. Lastly, pus is more frequently found in the veins than in the arteries ; which I think may be satisfactorily accounted for by the difference in the functions of these vessels': the pus which is found in the arteries

may, in the great majority of cases, be consi-
dered as having been formed there ; whereas
pus found in the veins, though in some instances
it may be secreted there, is much more fre-
quently brought thither by absorption.

CHAPTER I.

LESIONS OF CIRCULATION.

THE veins, like the arteries, present two dif-
ferent kinds of redness ; one the effect of active
hyperæmia, the other produced after death by
the imbibition of the blood. The latter species,
which is much the most common, presents the
same uniform aspect as in the arteries, but the
shade of colour is different, owing to the differ-
ent nature of the blood contained.

The redness of the veins from imbibition of
the blood is more common than that of the arte-
ries from the same cause ; which appears to de-
pend on the circumstance of its occuring at an
earlier period after death. If we examine the
aorta and the inferior cava in the same subjects,
we shall find the latter vessel quite red in seve-
ral cases where the aorta does not present the
slightest alteration of colour. The redness of
the veins differs also from that of the arteries in

this, that it pervades all the coats of the vein, whereas in the arteries it is generally confined to the inner coat.

It may be laid down as a general principle that, in the veins still more than in the arteries, the existence of redness unaccompanied by other morbid changes cannot be considered as a proof of disease.   M. Gendrin repeated on the veins of living animals the same experiments, and with the same results, as on the arteries.   These have been already described in the preceding section.

CHAPTER II.

LESIONS OF NUTRITION.

The internal membrane of the veins is sometimes considerably softer than natural, and may be readily broken up into a soft pulpy mass by scraping it with the scalpel.   Whenever a vein appears red in its inner surface, we should examine the consistence of its inner membrane before we decide as to the nature of the redness.

The same membrane is also in some cases much thicker than natural ; this thickening may be uniform, or may be confined to one or more points ; in the latter case, the inner surface of the vessel has a rough uneven appearance.

At the same time that the internal membrane presents either of these alterations, it may retain its natural pale appearance, or may present different shades of colour.

The valves of veins, being formed by the folds of the inner membrane, are liable to the same alterations as the membrane itself. I have seen them so much thickened that their natural transparency was lost ; while, in other instances, they were partially destroyed, and resembled so many fringes floating loose in the cavity of the vessel, or irregular bands passing across it. When the valves are altered in either of these ways, we generally find a certain portion of coagulated blood adhering to them.

The middle membrane also is liable to become softened. When this alteration occurs, the vein may be torn by the slightest effort ; and even during the life of the individual, any exertion which causes an accumulation of blood in the veins may produce their spontaneous rupture.

The middle membrane is likewise subject to atrophy, and then the parietes of the vein acquire an extraordinary degree of tenuity.

Lastly, this membrane is liable to be hypertrophied, and in this way are produced a variety of appearances in the parietes of the vein, according to the situation of the hypertrophy, and the degree to which it arrives. One of the first

effects of hypertrophy of the middle membrane is to render it distinctly visible in a number of veins where it naturally exists in such a rudimentary state as to be imperceptible. In those places where it usually is visible, the longitudinal fibres are rendered much more distinct, and, as the hypertrophy increases, the membrane assumes quite another appearance ; it loses its transparency, acquires a yellowish colour, and presents a certain degree of elasticity, so that when the vein is cut across, its orifice remains open as that of an artery would do. Indeed the outer appearance of a vein in this state of hypertrophy presents a striking resemblance to that of an artery ; but if we dissect its middle membrane, we find this remarkable difference between it and the middle coat of arteries, that the former never presents any trace of circular fibres, nor does it ever possess the same degree of elasticity as is observed in the true arterial coat.

Can the middle coat of veins be ever so hypertrophied as to present the appearance of muscular tissue ? I think I once detected the existence of muscular fibres in the parietes of the inferior cava, not far from its termination in the heart ; the parietes of the vessel were in an extreme degree of hypertrophy, and the appearance of muscular tissue struck me at the time as being very well marked; how-

ever, I should like to repeat the observation before I positively announce the fact, which is the more interesting to ascertain, as it would be an example of the same formation being produced in man by a morbid change which is in other animals the natural condition of the part. In the horse, for instance, the structure of the vena cava, near its entry into the right auricle, appears evidently muscular, and seems in fact a prolongation of the auricle.

True hypertrophy of the middle coat may be confounded with another case in which the thickening of the membrane is only apparent, and is produced by a quantity of blood accumulating in its tissue. The parietes of the vein in this affection resemble a portion of cellular tissue in a state of phlegmon not yet advanced to suppuration, and in other cases, a dense coagulum : the colouring matter of the blood is subsequently absorbed, and there remains behind only the white fibrine in a solid form, and combined molecule to molecule with the coats of the vein, which then present the *lardaceous* appearance described by authors as a peculiar tissue, though in reality it is nothing more than a deposition of blood from which the colouring matter has been absorbed, and the fibrine become incorporated with the tissue of the part. The different stages of this process may be easily traced.

The alterations of nutrition in the external membrane of veins, are the same as in the external membrane of arteries, which have been already described.

The several membranes of which the parietes of the veins are composed are liable to ulceration and perforation. It is more common to find the veins perforated than simply ulcerated; indeed, there are very few of the principal veins in which perforation has not been observed. It has been seen, 1. in the superior cava both within and without the pericardium; 2. in the inferior vena cava; 3. in the vena portæ, both within and without the liver; 4. in the splenic vein; 5. in the jugular vein; 6. in the subclavian; 7. in the veins of the extremities; and, 8. in the veins that run between the coats of the intestines.

In some cases, perforation of the vein takes place without its coats exhibiting any appearance of disease in the vicinity of the perforation; in such cases, the rupture either occurs spontaneously, or is caused by some external violence. I remember the case of a man, who, whilst engaged in a violent struggle, fell senseless to the ground, and expired in a few seconds: on dissection, it was discovered that there was a perforation of the abdominal vena cava; the borders of the perforation seemed

as if they had been torn asunder, and the coats of the vein in the neighbourhood were perfectly healthy.

In other cases, the vein which is the seat of perforation presents different morbid alterations, such as ulceration, softening, atrophy, &c.

Lastly, there are some cases in which the perforated vein is situated in the midst of diseased parts ; the affection of the vein is then only secondary, and its solution of continuity proceeds from without inwards. In this way, veins have been repeatedly found perforated at the bottom of carcinomatous ulcers of the stomach.

The several alterations of nutrition that have been enumerated may alter to a greater or less extent the caliber of the affected veins.

The term *varicose* has long been applied to the veins in a state of dilatation : the following are the principal species of this affection :—

1st Species.—Simple dilatation unattended by any other alteration, either affecting the whole length of the vein, or existing only at intervals.

This first species of varix often co-exists with the chronic hyperæmia of an organ, and sometimes persists after the hyperæmia has totally disappeared ; in other cases it is unconnected with any affection of the capillaries.

2nd Species.—Dilatation of the veins, either uniform or at intervals, with thinning of the parietes at the dilated points.

3rd Species.—Uniform dilatation of the veins with increased thickness of the parietes.

4th Species.—Dilatation of the veins at intervals, with thickening of the parietes at the points where the dilatations exist.

In these two latter species, the vessel increases in length as well as in breadth, and in consequence becomes quite tortuous in its course.

5th Species.—Dilatation of the veins, with the developement of septa or partitions which divide the interior of the vessel into small compartments that allow the blood to stagnate and coagulate. When this alteration takes place only at intervals, it may readily be mistaken for a congeries of small tumours composed of a spongy tissue, into which the vein discharges its contents ; but on examination it will be found that these tumours are formed by the vein itself, which is dilated, and its interior divided into cells.

6th Species.—Dilatation of the vein, its interior divided into a number of separate compartments, as in the preceding species, and in addition, its parietes drilled by a number of minute holes, which allow the blood to pass from

the vein into the surrounding cellular tissue. This morbid alteration of the venous structure is precisely analogous to the natural perforated condition of the splenic vein within the spleen. The tumours described by authors under the name of *erectile tumours,* are in reality nothing more than a cluster of small veins communicating with each other and with the surrounding cellular tissue by the holes with which their parietes are drilled in the manner just described. The cellular tissue, situated between the veins thus affected, is liable to various alterations of nutrition and secretion, whence arise the vast variety of appearances which these tumours present, the numerous morbid productions that are found in them, the different degenerations which they are said to undergo, their transformation into cancer, &c. &c.

The structure of every variety of hæmorrhoidal tumour may be referred to one or other of the six species of varix just enumerated ; but these alterations are not solely confined to the veins in the neighbourhood of the anus : I once found the external jugular altered in the manner described in our sixth species. The tumours formed by dilated veins sometimes disappear spontaneously ; in such cases, the veins are generally found on dissection completely obliterated.

Amongst these different species of varix, there are some which evidently depend on an increased activity in the nutritive process; others again depend on a diminution in the activity of that process, whilst others are simply the mechanical result of pressure exercised on some principal vein ; in this case the small veins which pour their contents into the venous trunk on which the pressure is exercised become greatly dilated and elongated, and their parietes are often considerably hypertrophied.

Contraction and obliteration of the venous cavities are much more uncommon than their dilatation. They may be produced, 1. by causes existing outside the veins, such as tumours which mechanically compress them ; 2. by causes seated in their parietes ; or, 3. by causes that exist in their interior. Amongst these, the coagulation of the blood must be included ; indeed, it is now universally admitted that the blood may coagulate within the veins during the lifetime of the individual. What the circumstances are which influence its coagulation, it is not so easy to determine : in some cases, it appears to depend on the state of the blood itself ; in others, on the state of the venous parietes, as when they cease to exert their usual influence on the course of the blood, or when their interior surface is rugged and uneven, or,

lastly, when they secrete pus and other matters which are known to promote the coagulation of the blood.

Whatever be the circumstances under which the coagulum is formed, it may either still allow the blood to pass through in a smaller stream, or may block up the passage altogether. These coagula present considerable variety in the firmness of their adhesion to the parietes of the vein, in their physical characters, (colour, density, &c.) and in their organization. They live precisely as the veins in which they are formed, and, like every other part endowed with life, keep up a constant process of nutrition and secretion, and are also liable to become diseased.

The obliteration of the veins may be still more complete than in the preceding case ; and instead of their cavities being plugged up with coagula, it sometimes happens that no vestige remains of any cavity, and the vein becomes a fibro-cellular cord.

Obliteration of the veins often gives rise to the establishment of a collateral circulation, which may be kept up either by a number of small veins, or by one principal vessel that acquires an unusual developement.

M. Reynaud has published a case * in which

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* *Journal Hebdomadaire de Medecine*, tom. II. p. 84.

the left iliac vein was completely obliterated from above the origin of the internal hypogastric vein to the point where the superficial hypogastric is given off by the femoral. The obliteration was caused by a coagulum of blood which adhered firmly to the sides of the vessel. The superficial hypogastric vein was considerably increased in size, and ascended as high as the umbilicus, where it divided into three large branches that descended towards the femoral vein of the right side, after reuniting into a single trunk similar to that which arose from the femoral vein of the left. The portion of the iliac vein that was obliterated was surrounded by a mass of encephaloid matter. The subject of this observation was a woman, sixty-one years of age, who in her eighteenth year had had an attack of œdema in the lower extremity of the left side, and had ever since been subject to similar attacks in that limb. It is, therefore, highly probable that the obliteration of the vein commenced at the period when the dropsical affection first made its appearance.

In another individual, affected with aneurism of the aorta, M. Reynaud* found the superior cava so compressed by the aneurismal tumour that its cavity was completely obliterated. The

* *Journal Hebdomadaire de Médecine*, tom. II. p. 110.

interior of the vessel, near its entrance into the auricle, was found occupied by cellular adhesions that united the sides of the vein together. These adhesions consisted of well organized bands, similar in their texture to those cellular bands that often unite the pulmonary to the costal pleura. The veins on the lateral surface of the chest were remarkably developed, and anastomosed freely with the epigastric vein, which was also considerably larger than usual. This extraordinary developement of the superficial veins induced M. Reynaud to form his accurate diagnosis that the circulation was obstructed in the superior cava, and was carried on principally by the vena azygos and inferior cava.

I have already alluded to the effects which result from the obliteration of the veins. The ingenious researches of M. Bouillaud have clearly proved that this obliteration is sometimes the cause of dropsy.

But few congenital lesions of nutrition have as yet been observed in the veins. Two superior venæ cavæ have been sometimes found entering the right auricle ; and the jugular vein has been seen arising directly from the same auricle. A still more remarkable deviation from the natural distribution, is that where one of the pulmonary veins is inserted into the vena

cava ; the necessary consequence of this ano-
maly is the immediate return into the venous
system of a portion of newly aerated blood.

CHAPTER III.

LESIONS OF SECRETION.

THE veins, like all other parts of the animal
economy, are subject to depositions of that
plastic, organizable substance, which, whether
extended into membranes, or condensed into
amorphous masses, seems to be the origin of a
great variety of morbid productions.

In the veins this plastic substance is found
deposited, 1. on their external surface, in which
situation it may produce adhesions between the
veins and the surrounding parts ; 2. between the
coats of the vessel ; and, 3. in the interior of its
cavity. When the circulation is interrupted by
a ligature or any other cause, this plastic sub-
stance becomes organized, is converted into cel-
lular tissue, and eventually obliterates the cavity
of the vein. But, if the circulation in the ves-
sel is not interrupted, the plastic substance lines
its internal surface in the form of a delicate
membrane, which in some cases consists of a
simple albuminous layer without any trace of

vitality, and in other instances, as M. Ribes was one of the first to point out, presents evident traces of organization, and is traversed by vessels of its own. Underneath these false membranes, the surface of the vein is sometimes found of a deep red, and sometimes perfectly colourless. They may either be so circumscribed as to form only a few small isolated patches, or so extensive as to form an uninterrupted layer lining the entire of one, or even of several veins. In the veins, as in all other tissues, this plastic substance may gradually lose its physical characters, and be insensibly transformed into pus. This fluid, like the plastic matter of which, as already stated, it is only a modification, has been found, 1. on the external surface of veins, 2. between their coats, and 3. within their cavity.

The pus which is found in the interior of the veins may either have been formed there, or may have been introduced thither by the blood from some other point in the economy. It may be pure or mixed with blood.

That the pus formed in an organ may be absorbed into the circulation, and carried with its vehicle the blood to a distant part of the economy, is now no longer a matter of doubt; it is also highly probable that, in many instances where pus has been found in the interior of ve-

nous coagula, it has been formed in these coagula in consequence of some peculiar modification of the blood itself. As I have already adduced several facts in support of both these opinions, I shall at present speak only of those cases where the pus has been formed by the veins in which it is found.

The irritation which produces suppuration of the veins may arise without any appreciable cause ; this, however, is very rarely the case : more frequently it succeeds to some external injury, such as a puncture or ligature. In such cases, the irritation is almost invariably propagated from the injured point towards the heart, that is to say, in the direction of the circulation.

The effusion of plastic matter or of pus into the interior of veins very frequently accompanies the active hyperæmia of the organs to which they belong. M. Ribes has repeatedly found the veins red, thickened, and lined with a false membrane, in parts affected with a simple erysipelatous or phlegmonous inflammation. M. Velpeau has seen the femoral vein and its branches filled with purulent matter in women labouring under the disease called *phlegmasia dolens*. Pus has likewise been observed in the veins ramifying near diseased joints, unhealthy stumps, and fractures. M. Louis and others have found the uterine veins laden with pus

in several cases of acute metritis.*   M. Gendrin † states, that in several cases of intestinal ulceration, he observed the veins in the immediate neighbourhood of the ulcers filled with pus.   The same author mentions his having found puriform matter in several of the veins of the brain, in a woman who died of acute encephalitis.   In a case of caries of the temporal bone, Abercrombie found the lateral sinus on the diseased side filled with pus.

I have myself seen the vena portæ and its branches lined with a false membrane, in an individual whose intestines and liver were diseased; and if we consider that the villi of the intestines are (as M. Ribes has demonstrated) principally composed of minute branches of veins, it will appear highly probable that irritation of the veins plays a very principal part in several of those varieties of hyperæmia of the intestines where the redness is almost exclusively confined to the villosities.

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* I have recorded several cases of this description in the *Clinique Médicale.* M. Dance in an interesting work on the subject just published, mentions his having found, in a great number of women who died shortly after delivery, the veins of the ovaries and uterus filled with pus ; and in some of these cases there were also collections of purulent matter in the lungs, spleen, joints, in the serous membranes, and even in the substance of some of the muscles.   In some of these cases, on bleeding the patient, he discovered pus in the veins of the arm likewise.

† *Histoire Anatomique des Inflammations.*

The different lesions of veins just enume-
rated may either succeed to various morbid al-
terations which had previously taken place in
the other anatomical elements of the part, or
may have been themselves the origin and source
of those alterations. Moreover, the irritation of
the veins, whether primitive or consecutive, may
exercise a remarkable influence on other organs
at a distance from the real seat of the irritation.
This influence may be produced, 1. by simple
continuity of tissue, as when that portion of the
liver or lung which immediately surrounds the
affected vein participates in the disease ; 2. by
the pus being transported to distant organs,
whether it is deposited in them, or merely cir-
culates through them ; 3. by the mechanical ob-
stacle which the diseased veins present to the
venous circulation.

There is another morbid secretion which,
though exceedingly common in arteries, is very
rarely found in veins ; I allude to the calcareous
matter. Morgagni and, after him, Bailie, found
patches of ossiform matter in the parietes of the
vena cava. Beclard found the femoral vein os-
sified at a point where it came in contact with
the femoral artery, which was itself similarly
affected. Dr. Macartney, of Dublin, observed
several depositions of calcareous matter in the
parietes of the external saphena ; and I myself

found in the parietes of the same vein a hard concretion, as large as a nut, and composed of phosphate of lime.

These calcareous concretions, instead of lying between the coats of the veins, sometimes push the internal membrane before them, and project into the interior of the vessel: the membrane in such cases generally contracts behind the concretion, and forms a peduncle which serves to attach it to the side of the vein. It is probable that these peduncles are sometimes ruptured or absorbed, and thus the concretion is completely detached from its connexion, and drops loose into the vessel. This rationale may serve to explain the origin of some of those calcareous concretions which have been found in the centre of the venous coagula : it is, however, possible that they may have been formed in the blood itself.

These concretions, which have received the name of phlebolites, are of various sizes, some being scarcely larger than a grain of millet seed, and others as large as a pea. They have been found in the dilated veins of the inferior extremity of the rectum, bladder, uterus, ovaries, and testicles, and in some of the subcutaneous veins of the lower extremities.

A substance perfectly analogous to healthy fat has been found in the parietes of the veins.

I once saw a case of this description, in which a tumour, presenting all the anatomical charac-ters of adipose tissue, was developed between the coats of the vena portæ, near its entry into the liver. This tumour, which was about the size of a walnut, projected into the interior of the vein, and almost entirely obliterated its cavity.

The vascular system in a number of animals not unfrequently contains entozoa. In the horse, we often find both the strongylus and the filaria in the aorta and its branches, more especially in the superior mesenteric. In a porpoise that I had an opportunity of dissecting, I found the right ventricle of the heart and the pulmonary artery filled with a quantity of entozoa belong-ing to the class nematoidea of Rudolphi. In the human subject, I know of only one case in which entozoa were really found in the vascular system. The case I allude to is detailed at length in my *Clinique Médicale :* the individual who forms the subject of it died in the wards of *La Charité*, and on dissection, we found the pulmonary veins filled with a great number of acephalocysts.

We sometimes find gas developed in the veins. In the great majority of cases this is evidently the result of the putrefactive process; but I am inclined to think that, in some in-

stances, the gases found in the veins after death are not simply the result of putrefaction, for I have decidedly seen the blood frothy and containing a considerable proportion of air both in the veins and in the cavities of the heart, in bodies that were examined at a very short period after death, long before they exhibited any symptom of incipient putrefaction. In these cases, the gas must either have been developed during life, or after the death of the individual; but even on the latter supposition we must admit some peculiar condition of the blood, for under similar circumstances it does not usually present this appearance.

To conclude, the gases found in the vascular system are sometimes introduced from without. Some years ago, a man died suddenly at the Hospital *Saint Antoine*, just as the surgeon was concluding an operation on the lower part of his neck. On dissection, the jugular vein of that side, the superior cava, and the right side of the heart, were found distended by a large quantity of gas, possessing all the characters of atmospheric air. It was at the time supposed that the death of the patient was caused by the sudden introduction of the air into the heart through the orifice of a large vein which was divided and remained open during the operation; and it was inferred that a similar accident

would occur whenever any of the principal cer-
vical veins were wounded, provided the orifice
of the wound were held open by adhesions or
other causes.   In order to decide this question,
MM. Magendie and Piedagnel instituted a set
of experiments on living animals, by which they
ascertained that when the jugular vein is cut
across, and the cardiac orifice of the vein held
open, the animal quickly dies, and on dissection
the veins and right side of the heart are found
distended with air.

It would appear that death is in these cases
produced by the air which is admitted into the
heart preventing that viscus from contracting
properly : perhaps also the quantity of air
which the heart drives into the pulmonary
veins is particularly injurious to the action of the
lungs.

However that may be, this much at least is
certain, that by introducing suddenly a large
quantity of air into any part of the venous sys-
tem, the animal is almost instantaneously killed;
whereas a much larger quantity of air may be
introduced with impunity provided it be done
very slowly.

SECTION IV.

DISEASES OF THE SPLEEN.

In order to arrive at any thing like an accurate knowledge of the nature and seat of the diseases of this organ, it is absolutely necessary to have a correct idea of its anatomical structure. I shall therefore, before entering on the subject of its morbid alterations, briefly relate the result of my observations respecting its anatomy in the healthy state.

When the spleen is by repeated washing cleansed from the blood which it contained, it appears composed of an infinite number of cells communicating with each other and with the splenic veins. The communication between the cells and the splenic veins is accomplished in the following manner: the large branches formed by the primary division of the splenic vein are perforated by an infinite number of holes, which allow a probe introduced through the vein to pass immediately into the splenic cells; at a greater distance from the trunk these

holes increase in size ; and at a still greater distance the venous coat ceases to form a continuous tube, and separates into filaments similar to, and continuous with, those by which the cells are formed. With respect to the artery, as soon as it enters the spleen it diminishes rapidly in size, and subdivides into small branches which seem to ramify on the walls of the cells, but it is impossible to follow them to their ultimate distribution. The splenic cells are formed by a number of fibrous filaments detached from the internal surface of the investing membrane of the spleen, and intersecting each other in every direction, leaving at each intersection certain intervals which constitute the splenic cells ; these fibrous prolongations terminate either by being inserted into the parietes of the vein, or by becoming continuous with the filaments that result from the subdivision of the venous parietes. They possess a considerable degree of contractility, and retract with force when cut across.

To recapitulate, the spleen is composed of the following anatomical elements, besides its nerves and lymphatic vessels : 1. a fibrous tissue forming externally an investing membrane or capsule, and internally divided and subdivided into numerous septa between which the blood is effused ; 2. a vein, which throughout its whole

extent communicates with the splenic cells by an infinite number of holes pierced through its sides, and which ultimately has its cavity confounded with the cavities of the cells ; 3. an artery which immediately subdivides into small branches that ramify on the septa of the cells, but of which the ultimate distribution as yet remains to be discovered.*

Since the parenchyma of the spleen may be resolved into two component parts, the part contained, which is blood, and the part containing, which is fibrous tissue, it follows that the alterations to which this organ is liable should be sought for in one or other of these parts : in fact, its diseases ought to be the same as those of the veins ; for, after all, what is the spleen but a vast venous network in which the cellular is substituted for the vascular form ?   In the veins, the part containing is liable to but few morbid alterations, whereas the part contained, presents an infinite variety of modifications, which cannot be too attentively studied, for in them is to be found, unless I am greatly mistaken, the true secret of the origin and nature of a great number of morbid productions.   The same modifi-

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* The structure of the spleen as I have described it, was known to several of the old anatomists.   Winslow's description of its anatomical structure is almost precisely similar.

cations may also be observed in diseases of the
spleen ; for the lesions of this viscus are, like
those of veins, of two orders : those of the first,
of comparatively rare occurrence, and of very
minor importance, are seated in the capsule or
in its fibrous prolongations which constitute the
walls of the splenic cells ; those of the second,
much more important, and of much more fre-
quent occurrence, are to be found in the matter
contained in those cells.   This matter, which is
in fact coagulated fibrine, although not posses-
sing any distinct organization, enjoys, perhaps,
a greater sum of vitality than the fibrous tissue
which contains it, and consequently is more
prone to become irritated and altered in its nu-
trition, and to separate from its own substance
various morbid productions.

CHAPTER I.

*Diseases of the Spleen which have their Seat in
the Matter contained in its Cells.*

THESE diseases are referable to alterations
either of nutrition or secretion ; but it is in
many cases difficult to decide on which of these
two alterations the disease depends ; whether,

for instance, the tubercles that are developed in the fibrine with which the cells are filled are separated from that fibrine by an act of secretion, or whether they are produced by a simple alteration in the internal arrangement of the fibrinous particles.

ARTICLE I.

ALTERATIONS IN THE CONSISTENCE OF THE SPLEEN.

THESE alterations evidently depend on a change in the consistence of the blood which fills the splenic cells.

Authors have described as softening of the spleen, that condition of the viscus, in which the blood contained in its cells has so lost its natural consistence, that it may easily be washed away, leaving behind it the cellular parenchyma of the spleen in a state of perfect integrity. In some cases of this description, the blood is found perfectly fluid, and the external surface of the spleen gives an indistinct sensation of fluctuation. The spleen, when in a state of softening, may either preserve its usual size, or be diminished, or, on the contrary, enlarged. The third case is by no means of rare occurrence;

indeed it is one of the anatomical characters most constantly found in continued fevers attended with adynamic symptoms.

Induration of the spleen (such at least as is commonly observed) is likewise caused by a modification in the qualities of the blood contained in its cells.   The blood in these cases is particularly dense and gives to the spleen when divided the appearance of a slice of liver, or of a muscle that has undergone a certain degree of congelation.

ARTICLE II.

ALTERATIONS OF SIZE.

The variations in the size of the spleen depend on the same cause as the changes in its consistence, that is to say, on the blood contained in its cells ; whether that fluid, being constantly deposited by the arteries, is not removed in sufficient quantity by the veins, and is thus simply accumulated there : or being once deposited, and having become endowed with life, it acquires the faculty of nourishing itself by intussusception, and, by the increased activity of its nutrition produces the hypertrophy of the organ.

When the spleen is preternaturally increased in size, it occupies a larger space and consequently a different position from that in which it is usually found. Sometimes it ascends into the left hypochondrium, thrusts the diaphragm before it, and, applying itself exactly to the internal surface of the ribs, produces as dull a sound on percussion over the left hypochondrium, as is produced in the right by the presence of the liver. In some cases of this description, the spleen does not project beyond the cartilaginous margin of the ribs, so that without the aid of percussion it would be impossible to detect its enlargement. In other cases the spleen projects beyond the ribs, and forms a tumour which is liable to considerable variety in its form and dimensions. This tumour may occupy, 1. the left hypochondrium; 2. the left flank; 3. the epigastrium; 4. the umbilicus; 5. it may even extend towards the right flank and occupy the hypogastrium or the iliac fossæ.

The spleen sometimes forms a tumour without being increased in size, in consequence of being thrust out of its place by a pleuritic effusion pushing the diaphragm downwards towards the hypochondrium.

The size of the spleen is also liable to considerable diminution : I have seen it no larger than a walnut. In this case, as in the preced-

ing, the consistence of the fluid contained in its cells may remain unaltered, or may be either increased or diminished. Of the circumstances which tend to produce this atrophy of the spleen we are totally ignorant.

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ARTICLE III.

ALTERATIONS OF COLOUR.

THE spleen sometimes presents, instead of its natural colour, either a bright red, or a deep black tint; this may occur only in scattered points, and the organ then assumes a mottled appearance.

In other cases, it assumes a whitish or yellowish tint in certain portions of its extent. The white or yellow masses thus formed may be either of the same consistence with the rest of the organ, or harder, or, on the contrary, quite soft and pulpy. It is evident from what we have seen occurring in the veins, that this merely arises from changes in the colour and consistence of the blood contained in the splenic cells, and not from the formation of any new production.

ARTICLE IV.

NEW PRODUCTIONS.

I THINK it highly probable that ere long it may be demonstrated that the different morbid productions which I am now about to describe are nothing else than the blood contained in the splenic cells modified in its qualities. The experiments of M. Gendrin, to which I have already had occasion to allude, seem to prove that the blood may be converted into pus. The result of my own observations has quite convinced me that, by a simple alteration in its colour and consistence, it may be converted into a substance perfectly analogous to the encephaloid tissue described by Laennec. Let us go a little farther, and suppose the blood in small circumscribed masses deprived of its colour, and diminished in its consistence, so as to become curdy and friable, and we have then all the essential characters of tubercle.

Pus has been occasionally observed in the spleen; it appears either in isolated drops dispersed through its parenchyma, or collected into abscesses of greater or less extent. These purulent collections may be separated from the surrounding parts by a false membrane, or may pass insensibly into the sound parts. The ab-

scesses not bounded by any distinct cyst some-
times acquire a very great size : I saw a case in
which three-fourths of the splenic parenchyma
were filled with pus ; the fibrous tissue remain-
ed unaltered in some points, and in others was
soft, pulpy, and easily broken down ; the cap-
sule itself had become friable in those points
where it was in immediate contact with the
pus, and it is highly probable that if the individual
had lived, the pus would have found its way into
the sac of the peritoneum. There are several
cases on record of abscesses of the spleen termi-
nating in this way ; they have also been known
to burst into the stomach, the colon, the thorax,
and the urinary passages ; and some have been
described as making their way through the mus-
cles of the abdomen, the back, or the loins, and
bursting externally.

The formation of pus in the spleen often
takes place at the same time that it is deposited
in other parenchymatous structures. In those
cases it is probable that the pus is formed else-
where, and only deposited in the spleen, as it is
in the other organs. In a woman who died at
La Charité, and on dissection exhibited a num-
ber of small abscesses in the spleen, lungs, liver,
and brain, it appeared that the uterus was the
organ in which the pus was originally formed ;
for the symptoms of metritis were those first

presented, several collections of puriform matter were found in the substance of the uterus, and all the uterine veins were filled with pus.

The cases where purulent matter is found only in the spleen, and where the disease, terminating in suppuration, is originally seated in that organ, are perhaps more rare than the preceding. One of the most remarkable cases of this description is that of a child three years old, whose spleen was literally converted into a cyst full of pus. The child had, during life, complained of violent pain in the left hypochondrium, accompanied with continued fever, and symptoms of irritation of the meninges. In this case the suppuration of the spleen gave rise to the usual train of symptoms which proceed from irritation of the gastro-intestinal membrane, but on dissection the whole of the alimentary canal was found perfectly healthy, as was also the brain.

Instead of pus, it is much more common to find tubercular matter in the spleen, generally in the form of minute grains isolated or clustered together. Tubercles of the spleen are very rare in adults ; they are more common in children, but are seldom found at any age unless when they exist in other organs at the same time.

Tubercles are common enough in the spleen

of certain animals : I have repeatedly found them in the horse ; and M. Reynaud ascertained by dissecting several monkeys that died at the menagerie at Paris, that although tubercles are excessively common in the lungs of those animals, they are still more common and more numerous in the spleen.

Cysts of various descriptions are also occasionally developed in the spleen ; their simplest form is that of small vesicles filled with serous fluid, which are sometimes found in great numbers either singly or in clusters. These vesicles are not confined to the splenic cells ; I have also found them in the interior of the splenic veins, some floating loose, others attached by peduncles to the sides of the veins, and others again lodged between their coats.

Cysts of much more complicated structure are likewise formed in the spleen. I have seen one with a fibro-serous tunic which contained in its interior a substance resembling suet, interspersed with hairs. In another spleen I found a cyst composed of serous membrane, filled with a substance like honey, and of a bright yellow colour.

Lastly, hydatic cysts are sometimes developed in the spleen, less frequently, however, than in the liver. As their mode of developement in this viscus differs in no respect from

that in other organs, it is unnecessary to enter here into any particular description of them.

CHAPTER II.

Diseases of the Spleen affecting its Fibrous Tissue.

THE morbid alterations which seem to affect principally the fibrous tissue of the spleen may be divided into those which attack its capsule, and those which are seated in the parietes of the splenic cells.

The alterations of the capsule consist, 1. in an unusual injection of its vessels ; 2. in its softening, which may even proceed so far as to occasion its rupture ; 3. in its thickening ; 4. in its transformation into cartilaginous or osseous tissue.

The alterations of the fibrous tissue which forms the walls of the splenic cells are as yet but little known. It has been observed, 1. in a state of softening ; 2. in a state of hypertrophy, so as to render the septa more numerous, or thicker, and consequently more apparent than in the natural state ; 3. partially transformed into cartilaginous or osseous tissue. I once found the spleen transformed into a mere osseous

shell ; the compartments into which its interior
was divided were likewise converted into bone,
and contained only a small quantity of reddish
fluid like muddy wine.

CHAPTER III.

*Nature and Causes of the Alterations of the
Spleen.*

THE various morbid alterations of the spleen
already described, may be divided into several
classes, according to the nature of their origin.

Some evidently originate in irritation ; but
there are not many belonging to this class.
Others depend on a simple modification in the
nutrition either of the parts containing, or of
the parts contained. Among these is softening,
which, in most cases at least, depends on some
alteration of the whole mass of the blood, as is
proved by its being chiefly observed in cases of
scurvy, and of adynamic or putrid fever. Others,
such as enlargement, and induration, appear
to arise from some obstruction to the venous
circulation. Thus, the spleen often remains
enlarged after agues ; and becomes enlarged
and indurated in many cases where the passage
of the blood through the vena portæ is obstruct-
ed by disease of the liver.

Lastly, others, such as pus, tubercle, &c., appear to result from a general tendency to their formation in the system, or to have been brought there and deposited by the blood in the course of its circulation.

SECTION V.

DISEASES OF THE LYMPHATIC SYSTEM.

IF we were to judge of the number of morbid alterations which this system presents to the anatomist, from the number of works written on its diseases, we should suppose that few parts of the body were so frequently found diseased. The contrary, however, is the fact; and the morbid changes either of the lymph or of its containing vessels that are appreciable on dissection, are exceedingly rare and altogether different from the descriptions given of them in books of speculative medicine. The structure and functions of the lymphatic ganglions are as yet by no means well understood, but their diseases (at least such as are appreciable to the anatomist) are much more common than those of the lymphatic vessels.

I shall now proceed to describe in order the morbid alterations, 1. of the lymphatic vessels; 2. of the lymph; and, 3. of the lymphatic ganglions.

CHAPTER I.

Diseases of the Lymphatic Vessels.

I HAVE examined the thoracic duct and principal lymphatic vessels in six hundred and odd subjects, and found but in very few instances any appreciable alteration in the parietes of these vessels.

In three cases only, the parietes of the thoracic duct appeared to me red and injected, and in one of these the interior of the duct was filled with pus, and its coats were thickened and friable.

The following case is still more rare than the preceding : I never observed it but in one instance, and am not acquainted with any other on record.   A woman died at *La Charité* with cancer of the uterus.   On dissection, the thoracic duct was found considerably enlarged, and of a dead white colour : it was filled with a puriform fluid, and its internal surface was studded with an infinite number of round white bodies, about the size of peas, in the intervals between which the parietes of the duct were much thickened, and presented a dead white colour, traversed here and there by reddish lines, and in other points were reduced to a soft pulp of a dirty reddish white.   The left subclavian

vein, into which the duct opened freely, was distended by a number of dense firm clots of blood, which had contracted an intimate adhesion to the coats of the vein, the inner surface of which was wrinkled and of a deep brown colour.   In this woman, the cervix uteri was converted into a black putrid matter, and large masses of cancer were developed in the pelvis, in the mesentery, and over all the lumbar vertebræ, where they completely enveloped the tributary branches of the thoracic canal.

The thickening of the walls of the thoracic duct may proceed so far as to produce a partial or even total obliteration of its cavity.   I once saw it converted into an impermeable fibrous cord, for a space corresponding to the third, fourth, and fifth dorsal vertebræ ; above this point it again became permeable, and was filled with lymph from a vessel of considerable size that came off from the duct a few lines below the point where it was obliterated, and re-entered it a short distance after it again became permeable, thus establishing a collateral circulation.

I have observed in the lymphatic vessels several of the same alterations as I have just described in the thoracic duct.   On opening the body of a phthisical patient who died at *La Charité*, I found on the external surface of the

intestines, over where they were ulcerated internally, the lymphatic vessels remarkably white and hard, and so dilated at intervals as to resemble a string of rounded nodules. At first sight, I mistook them for a series of tubercular grains, but, on cutting into them, I found that they were formed by the thickening of the coats of the lymphatic vessels ; from the knotted appearance which these vessels presented, it is probable that the thickening and induration of the coats was principally confined to the neighbourhood of the valves. There was no morbid matter whatever contained in their interior.

CHAPTER II.

Alterations of the Lymph.

INSTEAD of the natural fluid which the thoracic duct and lymphatic vessels usually contain, a variety of other substances both fluid and solid are occasionally found. In some cases these substances appear to have been formed there ; in others they seem merely introduced by absorption.

A fluid similar to blood has been found in the lymphatic vessels : Mascagni relates several cases of sanguineous effusion from the pleura

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and peritoneum, where the lymphatics ramifying
on these membranes were distended with blood.
We must bear in mind, however, that the lymph
contained in the thoracic duct not unfrequently
presents a rosy tinge, or even a deeper shade of
colour, and that the same appearance has also
been observed in some of the lymphatics in
cases where there was no reason to suppose any
admixture of blood. M. Magendie has lately
discovered that the lymph invariably presents a
shade of rose-colour whenever an animal has
been kept long fasting previously to examina-
tion.

M. Dupuytren, several years ago, found the
lymphatics of one of the lower extremities filled
with pus, in the case of a man who had a large
purulent abscess on the leg. For a long time
this remained a solitary observation; but within
the last two or three years several instances
have been met with of pus contained in the
lymphatic vessels. Besides the case related in
the last chapter, I found in another instance
the thoracic duct filled with pus in a woman
who had suppuration of one of the veins; the
coats of the duct were at the same time red and
friable. M. Velpeau has found purulent matter
in the lymphatics of the lower extremities in
women labouring under the disease called *phleg-
masia dolens*. I have seen several instances of

the lymphatics arising from ulcers of the intestines being filled with a fluid presenting all the characters of pus. The same remark has been also made by Soemmering and M. Gendrin. According to Mascagni, it is by no means uncommon to find pus in the lymphatics of the lungs in phthisical subjects : my own observation has not confirmed this assertion. In a case of gangrene of the lower extremities, Dr. Lauth of Strasburgh states that he found the lymphatics up to the thoracic duct filled with a sanious matter similar to that which existed in the gangrenous parts.

I have repeatedly found in the lymphatics a white curdy substance like tubercle. The thoracic duct was filled with matter of this description in a woman who died at *La Charité* in 1824 of cancer of the womb. It is not very uncommon to find this substance in the lymphatic vessels of ulcerated intestines in phthisical women. In these cases the lymphatics appear like so many knotted white cords passing from the intestines towards the mesentery. I recollect a case where a substance presenting all the characters of tubercle filled at the same time, 1. several of the inguinal lymphatics ; 2. the pelvic lymphatics ; 3. the superficial lymphatics of the lungs ; and, 4. the thoracic duct. The subject of this observation was a woman who died of cancer of the

uterus. The ganglions of the mesentery and those of the pelvis were converted into enormous masses of cancer. The ganglions of the axilla and those which surround the bronchi before their entrance into the lung, were likewise cancerous and greatly enlarged.

Mascagni and Saunders say that they have found a fluid similar to bile in the lymphatics of the liver: I have never seen this appearance myself, but I have repeatedly observed a remarkable yellow tinge in the lymph contained in the thoracic duct of icteric patients.

According to Soemmering, masses of calcareous phosphate have been found in the lymphatic vessels, and M. Lauth speaks in his Thesis of a case of caries of the iliac bones where the lymphatics of the pelvis were found filled with osseous matter.

We have already seen that the thoracic duct may be obliterated by the thickening or other morbid alteration of its coats: its cavity may likewise be obstructed by a variety of morbid substances, either formed in its interior, or brought there by absorption; and lastly, its obstruction may proceed from the pressure exercised on it by external tumours.

When the thoracic duct is obliterated, the circulation of the lymph may be kept up by a variety of supplementary passages. The principal of these are the following :—

1. The great lymphatic trunk of the right side.

2. Collateral branches arising from the duct below its obliteration, and re-entering it above that point.

3. A second thoracic duct arising from the receptaculum chyli, and ascending parallel to the other, without communicating with it, until it arrives near the left subclavian vein, where the two ducts unite and enter the vein by a single trunk.

4. Large lymphatic vessels opening directly into different parts of the venous system.   The researches of modern anatomists have discovered a considerable lymphatic vessel opening occasionally into the vena azygos, another equally large opening into the vena cava near the third lumbar vertebra, and likewise other lymphatics that pour their contents into the common iliac, the splenic, mesenteric, and renal veins, and likewise into the vena portæ.   These communications between the lymphatic and venous systems are much more visible in the bird tribe than in the human subject.

5. Lastly, it is admitted by anatomists that the lymphatics communicate with the veins in the interior of the ganglions, and at their origin in the different parenchymatous structures.

CHAPTER III.

Diseases of the Lymphatic Ganglions.

THE lymphatic ganglions are formed of two distinct component parts, 1. lymphatic vessels variously convoluted, and, 2. cellular tissue serving to unite those convolutions. This convoluted structure may be demonstrated in the human subject by injection, and is evident of itself in certain animals in which the cellular tissue disappears, and the glandular structure is replaced by plexuses evidently composed of an infinite number of lymphatic vessels mutually intertwined. It is therefore in these two anatomical elements that we are to look for the morbid alterations of the lymphatic ganglions.

These alterations do not occur with equal frequency at every period of life ; they are most common at that age when the ganglions are most developed, and their functions most active, namely in infancy.

Dr. Boeker, a German anatomist, states that he repeatedly injected with mercury lymphatic ganglions presenting different forms of morbid alteration, and that he invariably found the injection pass freely through all the convolutions of the vessels ; whence he concludes that in the

diseases of these ganglions, the lesion is, at least in the great majority of cases, confined to the cellular tissue that unites the convolutions of the vessels, or to the coats of those vessels, but that there is no obstruction of their cavity.

Active hyperæmia (inflammation) occurs frequently in the lymphatic ganglions, and may be either acute or chronic, confined to one ganglion, or extending to several. The lymphatic ganglions, when inflamed, are red, tumified, and soon become friable.

These ganglions are also subject to hypertrophy, in which state they acquire a considerable increase of size and hardness, and at the same time either become perfectly colourless, or else acquire a red or brown tint. The white induration of the lymphatic ganglions has been described by authors as their conversion into scirrhus ; in this state they present a homogeneous hard tissue, of a dead white or pearly appearance, and grating under the scalpel. A few red vessels sometimes appear in this tissue ; they are not, however, (as generally described,) vessels of new formation, but a remnant of the natural vascularity of the part.

The lymphatic ganglions are frequently the seat of different morbid secretions.

In the first place, they occasionally suppurate ; in which case the pus either infiltrates

their tissue, giving it a dirty grey colour, or is disseminated in small isolated drops, or is collected into an abscess, which in some cases occupies the entire gland, and destroys all traces of its parenchymatous structure, the cellular envelope of the ganglion alone remaining and forming a cyst to the abscess. Sometimes the disease proceeds still further, and the envelope itself ulcerates and allows the pus to escape.

There are few parts of the body where tubercular matter is more frequently deposited than in the lymphatic ganglions. It appears in the same varieties of form as the purulent matter of which we have just spoken ; namely, infiltrating the whole substance of the ganglion, occurring only in some isolated points, or occupying the whole of it. The lymphatic ganglions are one of the parts which best exhibit the developement of tubercle subsequently to an attack of inflammation ; but though in many cases the tuberculated gland presents unequivocal marks of antecedent congestion or inflammation, it is not the less true that in several instances there exists no evidence whatever of the formation of the tubercular matter having been preceded or accompanied by any species of hyperæmia.

I have, in deference to the generally received opinion, described tubercle in the lymphatic ganglions as the product of secretion,

though I am disposed to think the day is not far distant when it will be proved to derive its origin from a different source : perhaps it may yet be considered as simply the result of an alteration of the lymph itself, either spontaneous, or caused by a morbid condition of the lymphatic vessels, or perhaps resulting simply from its stagnation caused by some mechanical obstacle to its circulation through the lymphatic plexus.

Melanosis is in like manner frequently deposited in the lymphatic ganglions. A great proportion of the melanic tumours described by authors in the human subject and in animals, appear to me to be nothing else than lymphatic ganglions coloured black.

These ganglions likewise occasionally contain calcareous phosphate. Somtimes it appears like grains of sand mixed up with tuberculous matter, and sometimes the whole ganglion is metamorphosed into an earthy mass, which on analysis presents scarcely a trace of animal matter.

We seldom find these depositions of calcareous matter in the lymphatic ganglions but at an advanced period of life ; there are, however, exceptions. In a boy whose age certainly did not exceed sixteen years, I found in the ganglions around the bronchi, and in those of the

mesentery and pelvis, a number of chalky con-
cretions mixed with a fatty matter like suet.
His lungs likewise contained a number of these
concretions; and what rendered his case parti-
cularly remarkable, was the fact of his having a
large abscess in one of the iliac fossæ, with con-
siderable destruction of the iliac bone. Now
the question naturally presents itself, Was there
any connexion between the deficiency of the
earthy substance in the diseased bone, and its
accumulation in the ganglions? I am not pre-
pared to assert that there was; I shall, how-
ever, relate the following case, and leave the
reader to form his own opinion.

A woman, aged only thirty-three years, died
at *La Charité* of an acute attack of pleuritis,
which supervened during the course of a chro-
nic pulmonary affection. On opening the body,
we found the bodies of six vertebræ (the last
dorsal and five lumbar) completely destroyed.
We also found calculous concretions, 1. in the
lymphatic ganglions of the neck; 2. in those
placed between the trachea and œsophagus, and
between the œsophagus and vertebræ; 3. in the
bronchial ganglions; 4. in those which occupy
the fissures of the liver and spleen; 5. in those
of the pelvis; 6. in those of the axilla; and, 7.
in the inguinal ganglions. The lungs likewise
contained a number of these concretions.

In this case, as in the preceding, there was a coincidence between the deficiency of a certain quantity of osseous matter where it should naturally be deposited, and the deposition of this matter in those parts where it does not usually exist. In both cases, the calcareous deposition was found in the same parts, the lymphatic ganglions and lungs; and lastly, it was in that case where the loss of osseous matter was greatest, that the calcareous depositions were the most numerous and most extensive. M. Reynaud informs me that he observed another case at *La Charité* analagous to the preceding.

These facts may at least induce us to hesitate and consider a little before we adopt as infallible the doctrine which considers every deposition in the ganglions, whether of calcareous matter, tubercle, or melanosis, as the product of local irritation, the existence of which can, in many cases, only be inferred from analogy. The fact is, that but in very few cases should the cause of the morbid alteration of the lymphatic ganglion be sought for in the ganglion itself. I do not at present allude to those cases where the ganglion becomes diseased in consequence of some irritation of the part from which its lymphatics arise, as when disease of the mesenteric glands succeeds to irritation of the mucous membrane of the intes-

tines; but I wish to call the attention of my readers to those cases where the affection of the lymphatic glands is only one of the effects of a general cause, which at the same time exerts its influence on the most remote parts of the body, and produces the train of symptoms which usually charaeterize the scrofulous diathesis.

The lymphatic ganglions, when once they have become diseased, may derange the structure or functions of the surrounding parts, either by the irritation they communicate, or by the mechanical pressure they exert. In the chest, for instance, the bronchial ganglions sometimes compress the bronchi so forcibly as to impede the passage of the air into the lungs. M. Reynaud shewed me a remarkable instance of this, in the thorax of a monkey, where an enormous ganglion filled with tubercular matter had so compressed the main bronchial tube of one of the lungs, that its cavity was almost completely obliterated, the lung to which it was distributed had undergone a remarkable degree of atrophy, and the thoracic parietes of that side had contracted and fallen in, as in the case of absorption of a pleuritic effusion.

The diseased ganglions, instead of compressing the bronchi, may excite in them such a degree of irritation as to produce their perforation, and thus establish a free communication

between the bronchial tube and the interior of the diseased ganglion.   If the latter be in a state of suppuration, the pus which it contains may in this way find an exit, and recovery ensue : the same may happen if, instead of pus, the ganglion contains tubercle ; only, in the latter case, recovery will more rarely follow, inasmuch as tubercles are seldom developed in the bronchial glands unless when they also exist in the lungs ; I have, however, more than once seen instances of their being so.   I once saw a bronchial ganglion filled with calcareousde positions, which communicated with the interior of one of the bronchi.   The orifice of the communication was round, and its border smooth and black. The subject of this observation was an old woman, who had laboured under cough for a series of years ; it is evident that she might have expectorated calculi which did not come from the lungs.

In the abdomen, the lymphatic ganglions may, simply by the mechanical pressure they exert when enlarged, give rise to a variety of morbid phenomena.   Thus, when developed in enormous masses round the pylorus, they sometimes compress it so forcibly as to produce all the symptoms usually attendant on scirrhus of that portion of the stomach.   When accumulated round the hepatic duct, they compress its pa-

rietes, the bile no longer flows into the duode-
num, and jaundice ensues. I have seen these
ganglions occupying the place of the gall-bladder,
which they had so compressed as to produce its
almost total obliteration. In other cases the
ureters are nearly obliterated by the pressure
they sustain from them ; and lastly, the vena
cava is sometimes so compressed, and its circula-
tion so impeded, that the lower extremities be-
come œdematous, in consequence of the obsta-
cle thus presented to the venous circulation.

RESPIRATORY APPARATUS.

In order to have a general idea of the respiratory apparatus, we must imagine a surface of considerable extent placed in constant contact with the external atmosphere, and traversed by an infinite number of blood vessels and nerves. The purpose of this apparatus is to produce certain modifications in the blood by exposing it to the air, for the purpose of eliminating certain principles from the blood, and absorbing others from the air. The respiratory apparatus performs the functions of absorption and exhalation throughout its whole extent, but it is only in its more minute subdivisions that the air begins to produce its peculiar effects on the blood ; so that, in this respect, the apparatus may be considered as consisting of two parts ;* of which one, being destined to convey the blood with-

* Even in the primary divisions of the bronchi, we sometimes find a few laminæ or folds projecting from the internal surface, with a fine vascular network spread over them. These folds are analagous to the incomplete septa which arise from the internal surface of the vesicular pouch that serves as a lung in the frog tribe. It is not impossible that they may serve to expose the blood to the action of the air in the bronchi.

out affecting its qualities, is composed of tubes
of large diameter ; and the other, in which the
blood and the air mutually modify each other, is
only the continuation of the former, but the
tubes are subdivided, and consequently become
much smaller and more numerous, until each
of them terminates in a *cul-de-sac*, or air cell, as
it is generally called.   These air cells and the
minute tubes of which they are the terminations,
united together by cellular tissue in which run
the vessels and nerves that are distributed to
them, constitute the pulmonary parenchyma.
This anatomical arrangement may be demon-
trated in a variety of ways :

1. Reisseissen, by injecting mercury into the
bronchial tubes, converted the lung into an as-
semblage of vesicles distended, each, by a globule
of mercury, and without any direct communica-
tion with one another.

2. If we examine in a strong light a portion
of lung containing only a small quantity of
blood, we perceive on its surface an innumera-
ble quantity of minute vesicles filled with air,
and separated one from the other by cellular
tissue.

3. If we take a lung as free from blood as
possible, and force the air gently towards its
margin, we observe a number of minute tubes
filled with air, which, at their extremities and

laterally, present a series of vesicles ("*renfle-mens*,") having no communication with one another, and in every respect similar to the vesicles filled with mercury represented in the admirable plates of Reisseissen. This arrangement of the air cells is particularly evident in those cases where the pulmonary tissue is rarefied. M. Reynaud and I have repeatedly observed it in the human subject ; but it is still more evident in some of the mammalia, especially in the monkey tribe.

4. In certain morbid conditions, the pulmonary visicles dilate, and become quite apparent to the naked eye.

The cellular tissue, as we have already seen, isolates the air cells from each other, and likewise the lobules, which consist of a parcel of these air cells formed by the subdivision of one or more small bronchial tubes. These lobules are to the lobes what the latter are to the whole lung. It is important to fix our attention on the anatomical isolation, first, of the air cells, then, of the lobules, and lastly, of the lobes ; inasmuch as these different parts are frequently isolated in disease, so that one air cell or one lobule may be affected, without the disease necessarily involving the adjacent air cells or lobules.

The number of the air cells is not the same in all persons ; and hence result the various de-

grees of density which the lungs present in dif-
ferent persons, and even in the same person at
different periods of life. It is directly propor-
tional to the quantity of blood to be aerated in
a given time. For example, the pulmonary
parenchyma has its maximum of density in
those animals whose circulation is habitually
rapid, as in birds; on the contrary, it is at its
minimum of density in those animals whose
circulation is very slow, or in whom the whole
mass of blood does not pass through the lungs
at each round of the circulation, as in reptiles.
Even among the mammalia there is a consider-
able variety in the degree of their pulmonary
density, or in other words, in the number of their
air cells. In the horse, the density of the lung
is very great; in the dog it is also considerable;
and in both these animals it is greater than in
man. The human lung has the greatest possi-
ble number of air cells during infancy; conse-
quently it is then at its maximum of density,
and resembles the lung of the horse. On the
contrary, in old age, the number of air cells is
considerably diminished, and the lung then be-
comes so rarefied as to bear some analogy to the
lung of reptiles. This atrophy of the lung,
which is a natural condition in old age, may
likewise occur as a morbid alteration at other
periods of life : and in that character I shall pre-
sently describe it more fully.

The foregoing observations suggest a natural division of the diseases of the respiratory apparatus ; for, in its pathological alterations, as well as in its physiological functions, this apparatus presents two distinct parts, one which conveys the air to the blood, the other where the blood is elaborated by the air. In both these parts, however, the *seat* of disease is the same : in the air cells, as in the larynx, the disease must be situated either in the different anatomical elements which compose their parietes, in the cellular tissue exterior to these parietes, or in the matter contained within their respective cavities. But, the *form* of a larynx or of a large bronchial tube is not the form of an air cell ; hence arises a difference in the *form* of the morbid alteration : neither are the anatomical elements of the large air tubes the same as those of the air cells ; and hence a difference in the very *nature* of these alterations : lastly, the functions of the two parts are essentially different ; and hence a considerable difference of the importance of their diseases, and in the symptoms which attend them.

SECTION I.

DISEASES OF THE AIR TUBES.

UNDER this title, I include the diseases of the larynx and trachea, and of the bronchia as far as they can be traced with the scalpel : beyond this point, the parenchyma of the lung commences.

CHAPTER I.

Lesions of the Mucous Membrane.

THE morbid conditions of this membrane are identical from the glottis to the minutest ramifications of the bronchia.   Throughout its whole extent it is liable to alterations in its capillary circulation, nutrition, and secretion ; and I think, we shall form a more comprehensive, and at the same time a more accurate idea of these alterations, by not separating in our description the alterations of the larynx and trachea from those of the bronchia.   A false membrane is still the same, whether produced in the bronchia, or in the glottis ; the symptoms,

it is true, are different, but the morbid altera-
tion is essentially the same in each.

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ARTICLE I.

LESIONS OF CIRCULATION.

THE mucous membrane of the air-passages
is frequently affected with hyperæmia, the ana-
tomical characters of which in many respects
resemble those belonging to hyperæmia of the
gastro-intestinal mucous membrane.

Hyperæmia of the larynx, trachea, and large
bronchial tubes, is generally connected with
some irritation of those parts; but, in the mi-
nuter divisions of the bronchia, it is frequently
produced by a mechanical stagnation and accu-
mulation of the blood. This passive congestion
of the mucous membrane sometimes occurs
after death, from the gravitation of the blood;
sometimes, during the last moments of life, or
even at an earlier period in debilitated persons,
in whom the force of the circulation is much
weakened; and in some cases, it is caused by a
mechanical obstacle to the free return of the
blood to the left side of the heart.

It is necessary to distinguish these different
species of hyperæmia from the red or brown
colour which is readily produced by putrefac-

tion ; and it is also important to recollect, that
in the smaller bronchia, whose parietes are thin
and transparent, the red colour of the subjacent
parts may easily be mistaken for a hyperæmia
of the mucous membrane.

Hyperæmia of the mucous membrane lining
the air passages may be either general or partial.

General hyperæmia is sometimes formed
quite suddenly, and gives rise to all the distress-
ing symptoms of asphyxia.   Several cases have
been recorded of persons who, without any ap-
parent cause, were suddenly seized with great
difficulty of breathing, which went on progres-
sively increasing until it terminated in death ;
and, on dissection, the only morbid appearance
was a decided redness of the mucous membrane
lining the air passages throughout its whole ex-
tent.   Indeed, I can see no reason why a simple
congestion should not prove fatal in the lungs
as well as in the brain.   We must not, how-
ever, forget that the cause of these congestions
is still unknown ; and that the symptoms and
fatal consequences which generally attend on
them, are sometimes observed in cases where,
on dissection, there is not the slightest appear-
ance of congestion to be discovered.

Universal congestion of the air passages ge-
nerally assumes a less acute form than in the
preceding case, and its symptoms are propor-

tionally less formidable. The measles are ac-
companied by a hyperæmia of this subacute
form ; and one of the lesions most constantly
observed in continued fevers, is in like manner
a general congestion of the mucous membrane
of the bronchial tubes, which in measles extends
to the larynx and trachea also.

General hyperæmia of the mucous mem-
brane of the air passages seldom exists in a
chronic form.

The partial hyperæmia of this membrane
is a much more common affection. It presents
the following varieties, which are important to
be acquainted with, as they each give rise to a
different train of symptoms.

1. The larynx and trachea may be red,
while the bronchia are perfectly pale, and *vice
versâ*. In the trachea we sometimes observe a
curious disposition of the hyperæmia ; the red-
ness is confined exclusively to one side, and
ceases suddenly at the median line, like those
erysipelatous affections which attack one side
of the face exclusively. I have repeatedly ob-
served this form of congestion in cases where
only one lung was affected ; and the redness
of the trachea was always on the side corres-
ponding to the affected lung.

2. The large bronchia may be red, and the
smaller pale.

3. The small bronchia may be congested, while those of larger caliber present no trace of congestion. Congestion of the small bronchia gives rise to very formidable symptoms, such as violent dyspnœa, fever, &c. : in some cases these symptoms are attended with little or no cough.

4. On comparing together the bronchia of the different lobes with respect to their liability to irritation and congestion, M. Broussais was led to conclude that the bronchia of the upper lobes are those most frequently affected with hyperæmia.

Hyperæmia of the lining membrane of the air passages is not necessarily connected with any of the diseases of the parenchymatous sub-stance of the lungs : indeed, it is not very un-common to find the trachea and even the bron-chia perfectly pale in acute pneumonia ; and this is still more common when the pneumonia is chronic. It often happens that not the least trace of redness is perceptible in the bronchia, when the substance of the lung is crowded with tubercles ; in other cases the smaller bronchia are more or less red, but the large ones and the trachea retain their natural paleness. It is much more rare to find the bronchia exempt from redness, when the tubercles are softened or con-verted into cavities. In such cases, the hyperæ-mia is always most marked in those bronchia

which are nearest the tubercular excavations ;
but those which are more distant may likewise
participate in the redness, which sometimes ex-
tends to the trachea or even to the larynx.   In
the various cases above mentioned, the hyperæ-
mia sometimes proceeds from without inwards,
commencing at the larynx, spreading succes-
sively to the trachea, large bronchia, and small
bronchia, and at length reaching the pulmonary
parenchyma ; and sometimes it pursues the op-
posite course, commencing at the ultimate divi-
sions of the bronchia, and passing with greater
or less rapidity to the larger bronchia, trachea,
and larynx.

ARTICLE II.

LESIONS OF NUTRITION.

The most remarkable of these lesions, both
on account of the peculiar symptoms it pro-
duces, and the accidents it occasions, is the in-
creased thickness of the lining membrane.

There are two species of thickening of the
mucous membrane of the air passages : the first
depends chiefly on the membrane being in a
state of congestion ; the second is produced by
a preternatural degree of activity in the nutri-

tion of the membranous tissue, constituting the true thickening by hypertrophy.

The first species of thickening may occur at any point of the mucous membrane, but is most constantly observed in the larynx, and in the small bronchial tubes.

The tumefaction of that part of the mucous membrane which lines the margin of the glottis is sometimes so considerable, especially in children, in whom the aperture is particularly small, as to block it up almost completely, and consequently to oppose the free passage of the air into the lungs, and so produce all the symptoms of croup except the membraniform expectoration. I am disposed to think, that this form of croup is, at the least, as common as that which depends on the formation of false membranes ; and it certainly accounts more satisfactorily for the peculiar croupy symptoms, the great dyspnœa, the peculiar ringing sound of the voice and cough, and the no less peculiar sound which the column of air makes in its passage through the larynx.

The mucous membrane of the small bronchia is likewise liable to acute attacks of tumefaction from congestion ; the effect of which is to obstruct more or less perfectly the air tubes of a certain number of lobules, and consequently to produce a degree of dyspnœa proportionate to its extent.

The thickening of the laryngo-bronchial membrane by the hypertrophy of its tissue is of frequent occurrence in persons affected with cough of long standing : it may occur in different situations, which merit attention on account of the different phenomena they occasion. In the larynx, the thickening may extend over the whole of its surface, or be limited, 1. to the entrance of the glottis ; 2. to the cordæ vocales ; 3. to the ventricles ; or, 4. to the epiglottis. In the trachea, this hypertrophy of the mucous membrane presents nothing peculiar ; but, in the bronchia, it is important to distinguish whether it occupies the larger or the smaller tubes.

I have endeavoured in another work * to prove that a great number of the infinite varieties of bronchial rattle depend on the various degrees of thickening of the mucous membrane : in fact, the slightest alteration in the thickness of this membrane frequently produces the most remarkable modifications in the sound of the pulmonary expansion ; so that in general there is no proportion whatever, in these cases, between the alteration of sound and the alteration of texture.

The effects of hypertrophy are not confined to increasing the number of the molecules of which

* *Clinique Médicale.*

the mucous membrane is in the natural state composed ; it may likewise change the mode of arrangement of those molecules, and transform the affected tissue into another, according to the laws laid down in the first volume ; or, without producing this transformation, it may render the organization of the part more complicated than natural. M. Reynaud found a remarkable example of this effect of hypertrophy in an individual who had for many years previously laboured under chronic cough ; the bronchial mucous membrane had become perfectly similar to that of the intestines, and like it was studded over with a number of villous eminences.

Hypertrophy of the mucous membrane of the air tubes may present itself in other forms besides those already described ; thus, it may be confined to a circumscribed point, and produce there a tumour projecting more or less above the level of the surrounding membrane. These tumours have been oftener observed in the larynx than in any other part of the air passages. I recollect having seen a larynx some years back, at *La Charité*, the superior aperture of which was almost completely obstructed by a whitish cauliflower vegetation, which was evidently continuous by a broad basis with the mucous membrane. M. Ferrus recently exhi-

bited a specimen almost precisely similar, to the *Académie Royale de Médicine.*

There is yet another form of this hypertrophy, namely, its being confined to the follicles with which the mucous membrane of the air tubes is so thickly studded. In such cases, the internal surface of the membrane presents a number of round granular bodies, either white, or of a red, or dark brown colour, which are often surrounded by two coloured circles, one, round the centre, the other, round the base. This alteration of the follicles has often been mistaken for tubercles, or the variolous eruption.

No doubt, atrophy of the mucous membrane of the air passages occurs sometimes; but it has not as yet been described. It is frequently found in a state of softening, which, however, presents no peculiar character; so that the description given of the softening of the mucous membrane of the intestines is equally applicable here. This affection has been principally observed in the larynx, especially in the cordæ vocales, and at the bottom of the ventricles. When it attacks this portion of the mucous membrane, the bright fibres of the thyroarytenoid ligament appear almost completely bare, or if covered, it is only by a few spots of a reddish pulpy substance. I have more than once been surprised to find no other lesion in

the larynx than this softening of its mucous membrane, in individuals whose voice had been for a length of time either hoarse or altogether extinct.

The mucous membrane of the air tubes is likewise liable to ulceration ; the ulcers may be situated either in the larynx, trachea, or bronchia. Ulcers of the larynx are more common than those of the trachea, or bronchia ; but, as it seldom or never happens that we find ulcers in the larynx, on 'dissection, without at the same time finding them also in the parenchyma of the lung, we can scarcely form a correct idea of their effect on the general health. The disease which has been designated *phthisis laryngea* is, in most cases, nothing more than a pulmonary affection, accompanied by a morbid condition of the larynx, the symptoms of which predominate and mask the others, though in reality it is chiefly on the affection of the lungs that the emaciation, hectic fever, night-sweats, and other symptoms of phthisis depend.

Ulcers are found in different parts of the larynx, and, according to the situation they occupy, produce different modifications in the voice. They may be situated on, 1. the epiglottis ; 2. the cordæ vocales ; 3. the ventricles ; 4. the angle formed anteriorly by the union of the two sides of the thyroid ; and, 5. the mucous

membrane situated between the arytenoid car-
tilages ; in short, they are found in every point
of the internal surface of the larynx, though it
sometimes requires a minute examination to
discover them.

Ulcers of the larynx vary considerably in
size and number. Sometimes, only one small
ulcer is to be found in a larynx which in
every other respect appears perfectly healthy ;
sometimes the internal surface of the larynx is
literally eaten away with ulcers of different forms
and sizes ; and in some cases, again, there is
only one large ulcer to be found spreading over
one-half or more of the larynx.

Ulcers of the trachea occur more frequently
on its posterior surface, than in any other part
of its circumference; and as they are almost ex-
clusively confined to phthisical cases, it was sup-
posed that they are caused by the frequent con-
tact of the sputa : however, proofs are still want-
ing to confirm this supposition.   In some cases
these ulcers are exclusively confined to one side
of the trachea, which invariably corresponds to
the diseased lung, or, if both lungs be diseased,
to that which is most affected.

In the bronchia, ulcers are not so common
as in the larynx, but more so than in the tra-
chea. There is nothing peculiar in their ap-
pearance or which merits a particular descrip-

tion : besides, they are so uncommon that we may make a great number of dissections without once meeting them.

The ulcers of the mucous membrane lining the air passages generally have their bottom formed by the subjacent tissues.   Sometimes the delicate layer of cellular tissue interposed between the mucous and the other tissues is much thickened, and forms their bottom ; but, in other cases, they burrow still deeper, and the subjacent tissues are one after another destroyed, until the walls of the air tube are at length bored through.   This perforation produces different phenomona, according to the situation where it occurs.   Thus, it sometimes produces a direct communication between the interior of the tube and the external atmosphere, as in cases of fistula situated in the anterior angle of the thyroid.   I may remark, *en passant*, that the existence of such a fistulous communication does not incapacitate the individual from making a considerable effort, as M. Bourdon's theory would necessarily infer.   In proof of this assertion, I may adduce from Beclard, the case of a horse affected with that disease, which, in veterinary language, constitutes a *roarer :* this animal had an opening made in the trachea, through which he breathed *exclusively*, and in this state was seen by Beclard drawing a heavily laden waggon.

In other cases, the perforation of the air tube causes a communication between it and some neighbouring organ, either naturally hollow, as the œsophagus, aorta, &c., or rendered hollow by disease, such as the bronchial glands when excavated, or the parenchyma of the lungs. In the great majority of cases, the excavation of the lung undoubtedly precedes the perforation of the bronchial tube which is at a later period of the disease found communicating with it; but I am inclined to think that the ulceration and perforation of the bronchial tube occasion-ally precedes and gives rise to the formation of the pulmonary abscess. At the present day, it is the fashion to attribute almost every cavity that is found in the lungs to the liquefaction of a mass of tubercles; but this explanation is in many cases a mere assumption totally devoid of proof.

In the preceding paragraph, we have seen an instance of the air tubes being perforated from without inwards, the disease commencing in the lungs, and passing successively through the coats of the bronchion to its inner mem-brane; but this is not the only case in which the perforation is thus effected. The aorta much more frequently bursts into the trachea or bronchia, than these tubes do into it; and in those cases where the œsophagus and trachea

communicate, the perforation as often begins in the former as in the latter. Suppuration of the bronchial ganglions seems frequently to cause the perforation of the bronchia which they immediately surround, and by means of this perforation they discharge the morbid matter secreted in their interior. I once saw a case, where a large abscess of the thyroid gland produced the total destruction of the fibrous and cartilaginous tissues of the trachea, so that the pus contained in the abscess was only prevented from escaping into it by its mucous membrane, which had not as yet participated in the disease, though I think it highly probable it would have done so, had the individual lived for any time longer. M. Portal, in his *Traité de la Phthisie Pulmonaire*, relates a case of perforation of the trachea which afforded a passage to a number of hydatids that were formed in the thyroid gland. The patient died suddenly of asphyxia.

ARTICLE III.

LESIONS OF SECRETION.

THESE morbid alterations may occur, 1. in the gaseous secretion; 2. in the perspiratory exhalation; and, 3. in the mucous secretion.

The alterations of the gaseous secretion are as yet but little understood. It is, however, reasonable to suppose that, in certain diseases, there must be some alteration in the proportions of the different gases naturally exhaled by the mucous membrane of the lungs. This supposition is the more probable, as it is now well ascertained that other conditions, such as those of age and external temperature, produce considerable variations in the proportionate quantity of azote which issues from the lungs at each expiration.

The alterations of the perspiratory secretion are scarcely better known than those of the gaseous exhalation. *Perhaps* its increase gives rise to some of those serous fluxes that occasionally take place from the mucous membrane of the lungs, and that in this way the serous exhalation which usually issues from the lungs in a state of vapour, is by its excessive quantity condensed into the liquid form. In my *Clinique Medicale*, I have related the case of an individual who suddenly discharged an enormous quantity of serous fluid by the bronchia, at the same time that the fluid of a hydrothorax under which he had previously laboured was absorbed. It has been alleged that, in certain diseases of the skin where the cutaneous transpiration was wholly suppressed, the pulmonary vapour was

so greatly increased, that it was seen issuing
from the thorax in clouds, which rose to the
roof of the bedstead, from whence they again
descended in the form of an abundant dew.*

The mucous secretion has been more suc-
cessfully studied, and is consequently better
known, than either of the preceding.

The mucus secreted by the mucous mem-
brane of the larynx and bronchia may be modi-
fied either in its quantity, or in its qualities.

Its increase of quantity may be either an
acute or a chronic affection. It would be in-
consistent with the plan of this work to describe
the different appearances of mucous expectora-
tion, as the consideration of this subject properly
belongs to works on semeiology. To these
therefore, I refer the reader, for a detailed ac-
count of the numerous varieties which this
secretion presents in different diseases ; and
shall for the present confine my remarks to
those cases where the mucus is found in the
bronchia after death, and from its situation af-
fords some explanation of the symptoms observ-
ed during life, or even of the fatal termination
which ensued. The most remarkable case of
this description is that in which such an enor-
mous quantity of mucus is suddenly secreted by

* Alibert. *Precis des Maladies de la Peau*, article *Ichthyose.*

the bronchia, trachea, and larynx, that their cavity is completely filled, and consequently, as the air has no longer access to the lungs, death from asphyxia immediately follows. This immoderate secretion of mucus has been observed in adults, but it is most common in children. M. Blaud, in a work lately published, has described as a peculiar species of croup, several cases which presented many of the characteristic symptoms of that disease ; while, on dissection, the only morbid appearance consisted of an excessive accumulation of mucus throughout the whole of the air tubes.*

Without entering on the province of the semeiologist, I may remark that the mucus furnished by the laryngo-bronchial membrane sometimes becomes so fluid as to resemble serum, and sometimes acquires such a degree of viscidity that it adheres to the sides of the bronchia, and by its accumulation forms a kind of plug or stopper which effectually prevents the passage of the air, and thus produces a violent or even fatal dyspnœa ; as in a case of which I have detailed

* M. Bland has well remarked, that the word *croup* should rather be employed to designate a certain train of symptoms, than a single anatomical lesion ; and he accordingly establishes three varieties of this disease, founded on the nature of the morbid products furnished by the irritated membrane. The variety described in the text he denominates *croup myxagene*, and the other two, *croup puogene*, and *croup meningogene*.

particulars in my *Clinique Medicale.* In the cases hitherto enumerated, the sensible qualities of the secretion were not so changed, but that its mucous character might still be recognized ; but there are also cases, in which it gradually loses all its characteristic qualities, and is at last transformed into a fluid altogether different from mucus. Thus, instead of mucus, we sometimes find in the bronchial tube a fluid presenting all the characters of pus, and that too in cases where there is not the least appearance of ulceration in the bronchial membrane. There are likewise on record several well authenticated cases of puriform expectoration going on constantly for a length of time before death, although, on dissection, the mucous membrane presented no perceptible lesion, not even a blush of redness. In these cases we have an example of an alteration of the fluid secreted independent of any visible alteration in the secreting membrane.

Lastly, the air passages are sometimes, more frequently indeed than any other mucous cavity, lined with membraniform concretions. These concretions or *false membranes,* as they are generally called, have by some authors been considered as the product of the highest possible degree of irritation of the mucous membrane ; this opinion, if adopted, would so materially influence our practice, that it may be worth while

to examine carefully and dispassionately the ar-
guments which may be urged in its favour.   In
the first place, it is certain that the formation
of false membranes may be readily produced by
introducing into the air passages any highly irri-
tating substance, such as alcohol, dilute sulphu-
ric acid, oil of turpentine, &c. ; they have like-
wise been produced by inspiring chlorine or
ammonia for any length of time ; but these
results do not *constantly* follow : the action of
these irritants on the mucous membrane of the
trachea or larynx does not in *every case* deter-
mine the formation of a false membrane, conse-
quently there must be a predisposition on the
part of the individual.   But if this predisposi-
tion be very strong, it is evident, that the action
of much less irritating substances than any of
those above mentioned, nay, the slightest de-
gree of irritation, will be sufficient to determine
the formation of false membranes in the larynx,
trachea, and bronchia : whereas, if there be no
predisposition to the disease, the highest degree
of artificial irritation that we can excite, or the
most intense inflammation developed of its own
accord, will not be sufficient to cause the forma-
tion of a single false membrane.

Hence I think it is evident that the forma-
tion of false membranes in the air passages can-
not be accounted for solely by the intensity of

the irritation which preceded their develope-
ment. Is it because children are subject to
more violent irritation of the air passages than
adults, that the formation of false membranes is
so much more common at that period of life?
Certainly not; but rather because there is in
children a peculiar state or disposition of the
constitution, which causes any irritation that
occurs to present a certain train of symptoms,
follow a certain course, and terminate in a cer-
tain manner. Is it because two blisters create
different degrees of irritation, that one causes a
secretion of pus, while the other produces a
thick layer of a substance like hog's lard all
over the blistered surface? Such an opinion is
merely hypothetical; whereas all practitioners
are well aware that the difference of the secre-
tion coincides more frequently with certain ge-
neral conditions of the economy, which expe-
rience teaches us to recognize, than with any
determinate degree of irritation in the blistered
surface. In some children the cause which in-
fluences the formation of these false membranes
in the air passages is evidently general or con-
stitutional, inasmuch as they are often formed
at the same time in the nasal fossæ, in the ali-
mentary canal, around the anus, in the external
meatus auditorius, and wherever the skin has
undergone the slightest solution of continuity.

Within these last few years, much impor-
tance has been deservedly attached to the local
irritation which precedes or accompanies the
developement of these false membranes ; but,
whilst endeavouring to combat this irritation,
we should never forget that a principal cause of
their formation is to be found in the state of the
general health, and consequently that, in treat-
ing these affections, copious blood-letting is not
in every case the only indication to be fulfilled :
the abstraction of blood is, within certain limits,
of infinite utility in subduing the local affection,
but, when carried to excess, it may favour that
state of the system, of which the local affection
is often merely the effect.

The false membranes of the air passages
vary considerably in thickness, and in consis-
tence.   Some are so delicate as to be nearly
transparent, while others are several lines in
thickness.   Nor is their consistence less varia-
ble, for some can scarcely be touched without
falling to pieces, while others may be detached
whole and entire, and even bear to be taken up
in the hand and examined.

Schwilgué analyzed these membranes, and
found them composed of albumen united to a
certain proportion of carbonate of soda and of
phosphate of lime ; Bretonneau states that he
detected some fibrine in them.

The false membranes of the air passages in general present no trace of organization ; some authors, however, affirm that they have observed vessels passing in the form of filaments from the concretion to the subjacent membrane. We must not mistake for the result of organization those filaments which occasionally unite the false membrane to the mucous membrane underneath, as these are merely prolongations of the false membrane dipping into the mucous follicles ; neither should we be deceived by the red spots which are sometimes scattered over its surface, as they are in almost every instance caused by hæmorrhage from the subjacent mucous membrane. I shall not now stop to examine the cases which have been adduced to establish the fact of the organization of these false membranes, as they are as yet insufficient for that purpose : in *theory*, however, I see no objection to the possibility of their organization.

There are four principal divisions of the air tube in which these membranous concretions may occur : 1. in the larynx ; 2. in the trachea ; 3. in the large bronchia ; and, 4. in those of small caliber. In each of these divisions, they may exist in the form of isolated patches, or of one continuous layer. In some cases, these concretions occupy simultaneously the whole extent of the air passages ; in others, they begin

at the larynx, and extend more or less rapidly to the ultimate divisions of the bronchial tubes, or *vice versâ*. In some instances, they are first formed out of the air passages, and only make their appearance there, after having successively attacked the nasal fossæ, the mouth, the soft palate, and the pharynx.

I have already stated that the formation of false membranes in the air passages occurs most frequently in children ; but, even in childhood, some ages are more subject to this affection than others. It very seldom occurs before the end of the second year, although there is at this period of life a remarkable disposition to the formation of false membranes on other mucous surfaces, especially in the nasal fossæ, mouth, pharynx, and œsophagus. Why is it, that these membranes so seldom extend to the larynx at this age, and have such a tendency to do so afterwards ?

The formation of false membranes in the air passages is most commonly an acute disease : sometimes, however, it may be termed a chronic affection, as well from the length of its duration, as from the nature of the symptoms which attend it. In children it may assume a chronic character, so long as the membraniform exudation is confined to the trachea ; and in adults it sometimes appears as a chronic disease,

even when it affects the larynx. Except in those cases where the false membrane is of considerable thickness, the dyspnœa which accompanies it is not so much caused by its presence, as by the tumefaction of the subjacent membrane, and, not unfrequently, by the spasmodic contraction of the muscles of the larynx. False membranes, however, do occasionally produce suffocation by their presence ; more especially when they are seated in the last ramifications of the bronchia, where they are interposed between the air and the blood, and so prevent their mutual action on each other.

The formation of membraniform concretions is not a disease peculiar to man ; the *Journal de Medecine Veterinaire* for the year 1825, gives an account of a cow, that made a noise on inspiration like that made by horses called roarers ; this was attended with a convulsive cough, which appeared to proceed from the presence of some foreign body in the trachea. The animal died, and on dissection the internal surface of the larynx was found lined by a thick layer of false membrane. The same appearances have likewise been found in horses.

Laennec once found in one of the bronchial tubes of a phthisical patient a concretion that almost filled its cavity, leaving scarcely the breath of half a line between itself and the sides

of the bronchion. This concretion differed in its nature as well as appearance, from the ordinary false membranes, and rather resembled the polypous concretions which are found in the heart and arteries ; Laennec's idea of its origin was, that it was merely a coagulum of blood arrested in the bronchion during an attack of hæmoptysis.

Another class of concretions very different from the preceding, both in appearance and chemical composition, are sometimes found in the air passages. The concretions to which I now allude are essentially composed of phosphate of lime, and are generally known by the name of calculous concretions. They are formed either in the substance of the lungs, whence they escape into the bronchia, or in the air tubes themselves ; and may occur, 1. in the minute ramifications of the bronchia, the branched form of which they sometimes represent exactly ; 2. in the bronchia of larger caliber ; 3. in the larynx, where they have sometimes been found impacted in the ventricles.

The cause which produces the formation of calculi in the bronchia is no better understood than that which promotes their developement in other parts of the body ; but this much at least is certain, that their production cannot be accounted for by irritation.

Hydatids have also been found in the air passages ; in some cases, they are developed in those passages, and in others they are originally formed either in the pulmonary parenchyma, pleura, liver, thyroid gland, or some other contiguous organ, and subsequently burst into the air tubes. A hydatid, developed in one of the ventricles of the larynx, has been known to project so into the cavity, as to give rise to all the symptoms which usually attend the presence of a foreign body there.

The mucous membrane of the air passages sometimes allows the blood to escape from its vessels ; a certain proportion of cases of hæmoptysis arise in this way ; for, on dissection, it not unfrequently happens that no morbid appearance is found in the lungs of persons dying of hæmoptysis, except in the mucous membrane, and even there the alteration amounts merely to a slight redness.

When the hæmorrhage takes place in the minute bronchial ramifications, a part of the blood which is exhaled sometimes collects and coagulates there, and so imparts a black or brown colour to the lobules in which the coagulation takes place : such is, I conceive, the usual origin of the morbid appearance to which Laennec has given the name of *pulmonary apoplexy.* This lesion is characterized by the lung pre-

senting one or more circumscribed, indurated
masses, of a dark brown or black colour, and is
seldom found except in persons who have died
during an attack of hemoptysis ; I have, how-
ever occasionally seen it in the lungs of indivi-
duals who never had spit up any blood. It is
decidedly most common in those cases of he-
moptysis which occur during the course of
organic disease of the heart. In no case, how-
ever, can the morbid appearance termed pul-
monary apoplexy be regarded as the source of
the hæmoptysis : it is, in fact, a mere accidental
lesion, produced by the stasis and coagulation
of the blood in a certain number of the small
ramifications of the bronchia, while the hæmor-
rhage proceeds from a much larger extent of
the mucous surface. There is another species
of hæmorrhage which is seated in the parenchy-
matous structure of the lung, to which the name
of pulmonary apoplexy might with more proprie-
ty be applied ; but I shall defer the further con-
sideration of this subject until I come to speak
of the diseases of the parenchyma of the lungs.

CHAPTER II.

Lesions of the Tissues subjacent to the Mucous Membrane.

THE *cartilaginous tissue* which enters as an anatomical ingredient into the composition of the air tubes, is most subject to disease in that portion of its extent where it is most developed, namely, in the larynx. The cartilage of the epiglottis is not unfrequently the seat of disease, in consequence of which it sometimes loses its natural form ; but, this alteration is more generally caused by the thickening of its mucous coat, or of its submucous cellular membrane, than by any alteration in its cartilaginous tissue. Ossification of the epiglottis is exceedingly rare ; but a minor degree of induration is by no means uncommon, the effect of which is to render it less movable, so that it is with difficulty bent down to protect the aperture of the larynx. Sometimes there is scarcely a vestige of the epiglottis to be found, in consequence of its having been almost entirely destroyed by ulceration originally commencing either in its own tissue, or in the mucous membrane which envelopes it.

The other cartilages of the larynx present nearly the same morbid alterations as the epi-

glottis. Of these, the most common is ulceration, which, when superficial, renders their surface rugged and uneven, and, when it extends farther, causes a more or less extensive destruction of the part. Sometimes the ulcerative process begins in the soft parts, and from thence passes to the cartilaginous tissue ; in other cases the ulceration commences in the cartilage, and purulent matter is in consequence collected in front of the ulcerating cartilage, until a fistulous passage is formed for its escape : in general, the fistula opens on the mucous surface in the interior of the larynx, but in some instances it opens externally. The ulceration sometimes commences in the articulations of the different cartilages : in this case, the articulation is found filled with pus, the ligaments are destroyed, and the articulating surfaces more or less injured.

Ossification of the thyroid and cricoid cartilages occurs as a natural phenomenon in old age ; but, at an earlier period of life, it constitutes a true morbid state. I am not aware that the arytenoid cartilages have ever been found ossified.

The cartilaginous rings of the trachea are very seldom diseased, ossification being almost the only morbid alteration to which they are subject.

The cartilaginous tissue of the bronchia is, on the contrary, frequently altered from its healthy structure. In the first place, it is often affected with hypertrophy, and then not only becomes more apparent than in the natural state, but likewise changes its form and arrangement; so that where it generally appears in minute grains, we now find it forming segments of circles as in the large bronchia, and in the trachea. It also sometimes becomes ossified, so as to form masses which feel like calculi imbedded in the parietes of the bronchia. The following is an example of a much rarer species of ossification. On dissecting the body of an old man, M. Reynaud and I found the lungs full of hard masses, which, unlike the ordinary calcareous concretions, were composed of an infinite number of osseous spiculæ, arranged like the branches of a tree, and containing a continuous cavity in their interior, so small as barely to admit a hair. We both agreed that these arborescent concretions were in fact the ultimate ramifications of the bronchia converted into bone.*

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* I have since had an opportunity of examining the lungs of an old woman of 86, which were studded with a great number of cartilaginous and osseous concretions, which were evidently produced by the transformation of the parietes of the last ramifications of the bronchia into cartilaginous and osseous tissue.

Another morbid condition of the bronchial cartilages which deserves to be noticed, is a peculiar brittleness, in consequence of which they break into fragments that either project into the cavity of the bronchia, or become altogether detached, and remain loose in the bronchia, until they are expectorated.

The fibrous tissue which enters into the composition of the parietes of the air passages presents only two species of morbid alteration worthy of notice, namely, softening and hypertrophy. When the thyro-arytenoid ligament is softened, the voice is altered in a most remarkable manner. The anatomical characters of the softening of this ligament are the following : it loses its brilliant colour, becomes opake and dull, and is subsequently resolved into cellular tissue, or into an unorganized pulpy substance, which in its turn disappears, leaving the thyro-arytenoid muscle naked and exposed.

The fibrous tissue is also liable to hypertrophy, the consequence of which is, an evident increase in the thickness of the part into which it enters as an elementary ingredient.

The muscular tissue, which, in some animals is so well developed in the larynx, trachea, and primary divisions of the bronchia, is scarcely perceptible in man except in the larynx, and some points of the trachea. As a

morbid condition, however, I have in some in-
stances detected it in the parietes of the human
bronchia, in which I believe it always exists in a
rudimentary state, though it is only visible when
preternaturally developed by the effects of dis-
ease.

In the larynx, where the muscular tissue is
arranged in distinct faciculi, it presents certain
morbid alterations which deserve to be ranked
among some of the most serious diseases to
which this organ is liable. The principal of
these alterations are the following : the muscles
become softened, are reduced to a state of atro-
phy, or even completely destroyed ; and in other
cases they are found infiltrated with pus, mucus,
or tuberculous matter. I have more than once
found, on examining the larynx of individuals
who had during life completely lost their voice,
that the only morbid appearance which could
be detected to account for the aphonia, was
seated in the thyro-arytenoid muscle, the fibres
of which were in some instances reduced to a
remarkable state of atrophy, and in others, in-
filtrated by different morbid secretions, such as
pus, tubercle, &c.

Much importance was formerly attached to
the varicose dilatation of the veins of the air
passages, and several cases of hæmoptysis were
supposed to originate from this source : though

my experience has been tolerably extensive, I
have never yet found an instance of the morbid
appearance in question.

Tumours of different kinds occasionally
compress the nerves which are distributed to
the parietes of the bronchia, and thus give rise
to the same symptoms that would result if those
parietes themselves were affected.

We have now enumerated the different tis-
sues of which the air tubes are composed, and
described the morbid alterations to which they
are severally liable: the cellular membrane that
serves to unite these tissues together is likewise
subject to a variety of morbid alterations which
next claim our attention. In the larynx, the
cellular tissue is not unfrequently affected with
hyperæmia; it is likewise subject to hypertro-
phy, becomes thickened, indurated, and pre-
sents the appearance of scirrhus; by its in-
creased thickness it diminishes the caliber of
the larynx, impedes the action of the muscles,
and alters the form and movements of the
epiglottis. Serous infiltration is another affec-
tion to which this portion of the cellular tissue
is subject: indeed, œdema of the glottis, so well
described by Bayle, is nothing more than a con-
siderable infiltration of the cellular tissue situ-
ated between the folds of mucous membrane
which surround the rima of the glottis, and

which, from being thus distended and swoln, obstruct the passage of the larynx to a greater or less degree. This œdema rarely occurs as an idiopathic disease: it is most commonly connected with acute inflammation of the mucous membrane of the larynx, though it sometimes occurs during the progress of chronic affections of that organ. It is in some cases very slow in its formation, and does not materially affect the respiration ; in others, it commences suddenly, runs its course rapidly, and quickly terminates in asphyxia and death.

Pus is another morbid secretion occasionally found in the cellular tissue of the air tubes, either collected in the form of abscess, or infiltrating the tissue to a greater or less extent. I recollect a case in which one of the ventricles of the larynx was occupied by a fluctuating tumour which, on a slight incision being made into it, gave out a copious discharge of pus. The last morbid production which I shall enumerate is tuberculous matter; it is most frequently found in the walls of the larynx, in the form of small isolated masses. I once found in an infant a remarkable example of the secretion of tuberculous matter in the cellular tissue connecting the principal bronchia to the parenchyma of the lung; the parietes of the bronchia were in fact coated with a layer of it several lines

thick: there were no tubercles in any other part of the lung. The infant died in the hooping cough.

CHAPTER III.

Alterations in the Dimensions of the Air Tubes.

THE several morbid alterations which we have enumerated as occurring in the different tissues that enter into the composition of the larynx, trachea, and bronchia, not unfrequently lead to an alteration in the dimensions of these tubes ; this alteration may consist either in an increase or diminution of their natural caliber.

The diminished capacity of the air tubes is in general produced by some of the following causes :

1. Thickening of the mucous membrane. The contraction arising from this cause is in some cases very considerable : it occurs chiefly in the glottis and in the small bronchia.

2. The presence of a false membrane. It seldom happens that a false membrane really produces any considerable diminution in the caliber of the air passages, unless in the small bronchia, or in the larynx of children.

3. Foreign bodies, either introduced from

without, or formed in the part, such as calculi, hydatids, solidified mucus, coagula of blood, or bits of cartilage.

4. The compression of one of the air passages by a tumour situated externally to it. In this way, considerable deformity and contraction of the larynx is sometimes produced by the preternatural developement of the thyroid gland ; the same effect may be produced on the trachea or bronchia, by the pressure of an aneurismal tumour ; and the bronchia are often compressed or even obliterated, at their entry into the lungs, by an enlargement of the bronchial ganglions which surround them at that point.

The increased capacity, or dilatation of the air tubes was first particularly described by Laennec. It affects principally the smaller bronchia, the dilatation of which may readily be mistaken for abscesses or tuberculous excavations.

Dilatation of the bronchia does not always appear in the same form. The following are the principal varieties which it presents :

In the first, one or more bronchia appear uniformly dilated throughout their whole extent, so that those bronchial ramifications which in the natural state would scarcely admit a fine probe, attain to the size of a goose quill, or even

'exceed it, and in some instances become so di-
lated, as to admit the introduction of the finger ;
in such cases, we frequently observe a moderate
sized bronchial tube giving off branches much
larger than itself. These dilated branches are
often visible on the surface of the lung, where
they terminate in a sort of *cul-de-sac*, in the
walls of which the orifices of a number of mi-
nute bronchia are always visible ; not unfre-
quently, they terminate abruptly near the top of
the lung, either in a portion of black indurated
pulmonary parenchyma, in a fibrous or cartila-
ginous mass, or in a calculous concretion, which
in some instances exists outside the cavity of
the bronchion, and in others is contained within
a sort of *cul-de-sac*, that apparently forms the
termination of the dilated bronchial tube.

A second species of dilatation of the bronchia
is that in which the dilatation is limited to a
certain point of the tube ; the portion of the tube
thus dilated presents, at first sight, the appearance
of a circumscribed cavity excavated in the pa-
renchymatous structure of the lung. This mis-
take is particularly liable to be made, when the
dilatation occurs in the upper lobe, where, as is
well known, tuberculous excavations are gene-
rally found ; the dilatation is still more likely to
be mistaken for one of those cavities with
smooth polished walls, which are in all probabi-

lity the remains of the favourable termination of a tuberculous abscess. The size of the cavity formed by this species of local dilatation may vary from that of a grain of hemp seed, to that of an almond, or even of a walnut. Several bronchia may present this species of dilatation in the same lung ; and when they are situated close together, they form by their communications a sort of complicated sinus filled with puriform mucus, and bearing a strong resemblance to those tuberculous excavations that consist of a number of loculi or cells communicating together.

The last form of dilatation I shall enumerate is that in which one or more bronchial tubes present a series of successive fusiform dilatations between each of which the tube reassumes its natural caliber. In the dilated points, the parietes of the tube are generally thin and transparent, so that the mucus or puriform fluid which they contain may be seen through them. It not unfrequently happens that one lung contains a considerable number of these dilatations, which give it, when cut into, the appearance of containing a number of small abscesses. I have observed this form of dilatation of the bronchia more frequently in children than in adults.

In the different forms of dilatation just enumerated, the parietes of the dilated bronchia

are variously affected. In some cases, they are considerably hypertrophied, and the several anatomical elements which enter into their composition become more marked, and more fully developed, than in the natural state : sometimes, on the contrary, their parietes are reduced to a delicate membrane, in which it is impossible to discover any trace of either the fibrous or cartilaginous tissue.

Dilatation of the bronchia is seldom found except in individuals who have long suffered from attacks of chronic cough. One of the cases of this affection recorded by Laennec in his treatise on Mediate Auscultation, was that of an old woman, who died at the age of seventy-two, after having presented most of the symptoms of phthisis from the age of sixteen. On dissection, not a single tubercle was to be found in the lungs, but they contained a number of cavities, which on close examination proved to be dilatations of the bronchia. The largest of these cavities was about the size of an almond ; they were evidently continuous with the bronchia, which commenced dilating near the part where the cartilages disappear from their parietes, and gradually increased in size until their termination near the surface of the lung.

The bronchia may, however, become dilated in a much shorter space of time ; for they have

been found considerably dilated in children who had had the hooping cough during the last two or three months of their lives, and who had never had any cough previously.

When the dilatation of the bronchia is not considerable, it does not appear to exert any influence on the parenchymatous structure of the lung; but when it is very considerable, it compresses and condenses the surrounding parenchyma. Frequently, also, dilatation of the bronchia coincides with an indurated condition of the adjacent pulmonary substance, which, at the same time, becomes either of a grey or black colour.

SECTION II.

DISEASES OF THE PARENCHYMA OF THE LUNGS.

WE have already endeavoured to analyse the composition of the pulmonary parenchyma, and to reduce it to its anatomical elements. We have found it composed of three distinct parts, namely, 1. the vesicles or cells in which the last bronchial ramifications terminate ; 2. the parietes of these vesicles, formed by a delicate membrane, on which the pulmonary vessels and veins ramify in an extreme state of fineness; and, 3. the cellular tissue which serves to unite these parts together.

All the different diseases to which the lungs are liable must necessarily have their seat in one or other of these three parts ; and they have all in common the important effect of diminishing the surface which the blood presents to the action of the air. The diminution of this surface may depend on either of two conditions, a diminution in the caliber of the air cells, or a diminution in the number of their parietes.

The first of these conditions may be produced by a simple hyperæmia ; the second depends on atrophy of the pulmonary tissue. The greater number of the symptoms which accompany the diseases of the parenchyma of the lungs depend on this diminution of the aerating surface.

If portions of lungs presenting the most different morbid alterations be inflated and dried previous to examination, we then perceive the pulmonary parenchyma reduced to an assemblage of tubes and cells, and can distinguish the morbid alterations which have taken place either in the interior of these tubes and cells, in their parietes, or in the cellular tissue which unites them. These appearances are quite evident in some diseases, and may fairly be admitted by analogy in those affections which cannot be submitted to this method of examination.

CHAPTER I.

LESIONS OF CIRCULATION.

In the lungs, as in every other organ, the quantity of blood which circulates in the capillary system may be greater or less than natural : hence arise two different morbid conditions, *hyperæmia*, and *anæmia*.

ARTICLE I.

HYPERÆMIA OF THE LUNG.

THERE is no organ in the body which is more frequently found after death in a state of congestion than the lung. In fact, whenever an individual dies with any quantity of blood in his system, the lungs are invariably found gorged with that fluid, especially in their posterior part, to which the blood gravitates when the body lies, as it generally does, on its back. Even in those cases where the individual dies in a state of general anæmia, the most dependent portions of the lungs are usually found in a state of sanguineous congestion. This congestion is most considerable in those cases where the mortal struggle has been long protracted, and in those where death from asphyxia occurs in consequence of a mechanical obstacle to the pulmonary circulation produced by some organic affection of the heart.

It is, then, in the lungs as in the intestines, where, as we have already seen, a local accumulation of blood may be found in the dead body, which has had no share in producing any of the morbid phenomena observed during life, but was formed during the last moments of existence, or after life had ceased altogether. Hence it follows, that the existence of a simple conges-

tion, especially when it occupies the most dependent portions of the lung, is not sufficient to prove that a process of irritation or inflammation had been going forward there during life. Does an alteration in the consistence of the part afford a more certain criterion to judge by in such cases ? For a long time I was of opinion that when the lung was red and gorged with blood at its posterior portion, and at the same time was softer and more easily broken down than natural, it was a proof that the hyperæmia was caused by inflammation ; but I have since altered my opinion, and am now convinced that whenever the sanguineous congestion is so great that the lung contains a larger proportion of blood than of air, the pulmonary parenchyma is invariably soft and friable. The reason of this fact will readily be understood, if we reflect that, when the lung contains a much larger proportion of air than of blood, the parietes of the bronchia, when pressed by the finger, press in their turn on the compressible fluid they contain, and in this way, by compressing or expelling the air, retire before the pressure of the finger, and so escape being ruptured. But, when the lung contains a larger proportion of blood than of air, the former fluid being almost wholly incompressible, the pulmonary tissue cannot recede from under the finger, and is therefore easily ruptured.

In the cases hitherto considered, the hyper-
æmia of the lung was a mere passive phenome-
non, principally formed after death ; but in
another class of cases, the symptoms observed
during life afford unequivocal proof that the
pulmonary congestion found after death was
formed during life, and produced by inflamma-
tion.   Now, as the anatomical characters of the
hyperæmia are precisely the same in both these
cases, it follows that, in this instance at least, the
true nature of the morbid lesions found on dis-
section can only be known by the nature of the
symptoms observed during life.

Active hyperæmia (inflammation) of the lung
presents two degrees.   In the first, which alone
can be confounded with the passive congestion,
the bronchia are still permeable to air ; the pa-
renchyma of the lung is of a brownish red or
vermillion colour, and, when cut into, exudes
a frothy sanguinolent fluid mixed with air.   If
a lung in this state be pressed between the
fingers, it is easily ruptured, and its friability is
greater in proportion as the fluid which flows
from it is less frothy : it also becomes less cre-
pitous in the same proportion.   It may not be
improper to remark, that those lungs which
have naturally a great degree of density, crepi-
tate but very little.   I mention this, because the
habit of examining only the lungs of men might

lead to the mistake of viewing as a morbid condition the deficient crepitation which is a natural phenomenon in the lungs of children and of several animals.

In proportion as the quantity of air diminishes, and its place is occupied by blood, the parietes of the small bronchia and of the air cells, as well as the cellular tissue interposed between them, become more and more swoln, until at length a period arrives when these cavities are no longer permeable to the air, or are only so in a very few points. This constitutes the second degree of hyperæmia, which authors have described by the name of *hepatization*. The resemblance which the lung in such a state bears to the parenchyma of the liver is very striking. When it is cut into, a small quantity of blood exudes from the divided surface, but not a particle of air; if we press it under the finger, its tissue appears to have become remarkably friable, and is broken down with the greatest facility; and if it be cut into slices, and thrown into water, it sinks to the bottom. Sometimes the hepatized lung presents a granulated surface when divided with the knife, or torn asunder; in other cases the granular appearance is altogether wanting, and its surface, when cut, appears perfectly smooth. The granular appearance seems to me to depend on the

degree of tumefaction which the air cells undergo ; for when the tumefaction passes a certain limit, its effect is to approximate the cells so closely that they become confounded together, and the granulated appearance vanishes entirely.

If a piece of lung presenting either of the degrees of hyperæmia, congestion, or hepatization, just described, be carefully dried, it becomes quite evident that these alterations are formed in the manner we have described. When the lung is in the first degree of hyperæmia, the only morbid appearance it presents when dried is a reddish, yellow, or brown tinge in the parietes of its capillary bronchia and air cells ; and in some cases even this shade of colour is wanting, and the lung which, before being dried, presented a remarkable degree of congestion, when dried differs in no respect from a healthy lung. When the experiment of drying is tried on a hepatized lung, the parietes of the capillary bronchia and of the air cells invariably present a red colour, and are moreover considerably thickened, so as to cause in some points a remarkable diminution, and in others a total obliteration of their cavities. Whether the blood is simply accumulated in the vessels, or is effused into the coats of the air cells and bronchia, it is difficult, perhaps impossible, to determine ; but this much at least is certain, that the morbid alteration

known by the name of hepatization of the lung, is altogether produced by a considerable degree of sanguineous congestion of the parietes of the capillary bronchia and air cells, the effect of which is to diminish or obliterate their cavities. Even in those parts where the hepatization seems most perfect, it rarely happens that some small bronchial tubes may not be found still permeable to air ; and we sometimes find that when the lobe of a lung which appeared uniformly hepatized throughout, is dried and carefully examined, we can discover some capillary tubes and air cells which, instead of having their caliber diminished, are very considerably dilated, and are at the same time free from any appearance of congestion.

The two degrees of hyperæmia, the nature and form of which we have been engaged in considering, present three principal varieties in the extent which they occupy. In the first, the hyperæmia extends over an entire lobe, the whole of which appears in a state of congestion or hepatization, (*hyperæmia lobaris*). In the second variety, some lobules separated from each other by other sound lobules are the seat of the hyperæmia, (*hyperæmia lobularis*). In the third and last variety, it is not even an entire lobule, but some fractional parts of it, or in other words, some of the air cells which compose

it that alone are affected with hyperæmia, (*hy-peræmia vesicularis*). This last variety may exist only in a few points, or may show itself in the form of an infinite number of red granulations dispersed through the entire parenchyma of the lung : the same remark is also applicable to the second variety.

In the lung, as in other parts of the body, gangrene may succeed to every species of hyperæmia, whether mechanical or vital, provided it be so considerable as to impede or prevent the afflux of arterial blood to the part. I have already shown that gangrene is not necessarily preceded by any violent degree of irritation; but on the contrary, may be produced by any cause which retains the blood in the capillaries of the part, especially if by such stagnation the arrival of fresh blood by the arteries is prevented. In some persons, the slightest stagnation of the blood has a remarkable tendency to be followed by gangrene of the part : this disposition to gangrene, which in these persons is constitutional, may be produced in others by the introduction of certain substances into the circulation, such as the ergot of rye, the poison of certain reptiles, &c.

Gangrene of the lung sometimes succeeds to a violent irritation and hepatization of that organ; while, in other cases, it makes its appearance

unpreceded by any symptom of irritation what-
ever, and in others, again, the irritation which
precedes it is slight, and of a chronic character,
and such as occurs in a thousand cases without
ever producing any such consequence. Thus
the parenchyma of the lung sometimes becomes
gangrenous around tuberculous cavities, or
around one or more bronchia that had been for
a long time the seat of some chronic irritation.

Gangrene of the lung, from whatever cause
it originates, presents the following forms.

1. Uncircumscribed. The interior of the
lung then presents one or more undefined patches
in which its parenchyma is remarkable for its
gangrenous fetor, brown or livid colour, and di-
minished consistence.

2. Circumscribed. In this form of the dis-
ease, the pulmonary parenchyma is, for a defined
space, transformed into an eschar, which, as in
all other parts, has a constant tendency to limit
its extent, and to be eliminated. In order to ac-
complish this object, a process of suppuration is
established around it, one or more bronchia are
perforated, and the eschar, reduced to a fluid
mass, is thrown off with the matter of expecto-
ration. There then remains in the lung, in the
place occupied by the eschar, an ulcerous cavity,
filled with a dirty greyish fluid, which exhales
an abominably fetid odour. The parietes of

this cavity are in general not lined by any false membrane ; the pulmonary parenchyma which surrounds it is in some cases perfectly healthy, and in others, more or less diseased.

There is yet another species of hyperæmia of the lung, in which the blood, instead of accumulating in the parietes of the bronchia and air cells, escapes from its vessels, ruptures those parietes, and is collected into a clot in a cavity formed for itself in the parenchymatous substance of the lung. This constitutes the true pulmonary apoplexy, very different from that we have already described, where the only morbid change was the accumulation and coagulation of a certain quantity of blood in the bronchia. Here, on the contrary, the substance of the lung is ruptured and torn by the extravasated blood, just as the substance of the brain is in cerebral apoplexy. The hæmorrhage may be so extensive, that the greater portion of the lung is reduced to a soft fluctuating mass, in which there can only be distinguished some debris of pulmonary parenchyma, and a quantity of effused blood, partly coagulated and partly fluid. Such a hæmorrhage may take place very rapidly, and produce death in a few hours, or even in a shorter time. In other cases, the hæmorrhage is less extensive, takes place more slowly, and is productive of less alarming con-

sequences. Sometimes the hæmoptysis to which
it gives rise continues for some days ere it proves
fatal.   Another variety of this affection is that
where the blood passes from the interior of the
lung into the sac of the pleura, having ruptured
that membrane as well as the intervening pa-
renchyma.   Lastly, there are some cases in
which, as in cerebral hæmorrhage, a series of
phenomena are observed, the object of which is
to promote the absorption of the effused blood,
and in this way to affect a cure. Such appears to
have been the case in those instances where the
clot of a pulmonary apoplexy was found * sur-
rounded by a well organized cyst, the internal
surface of which was in all probability destined
to become an agent of absorption.

It sometimes happens that the blood extra-
vasated in the lung, instead of being absorbed,
has a tendency to acquire, as it were, a right of
settlement there, by becoming organized, and
thus rendered capable of performing the differ-
ent acts of nutrition and secretion.

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* Bouillaud.   *Archives de Médécine*, Novembre, 1826.

ARTICLE II.

ANÆMIA OF THE LUNG.

IN some bodies, the parenchyma of the lungs is found completely exsangueous. Such a state of the lung is no more to be regarded as healthy, than that in which it is found more or less gorged with blood. It may depend on three different circumstances.

1. On the sort of death which the individual dies : thus, the lungs of animals bled to death are found in this state.

2. On a diminution of the process of hæmatosis ; as occurs in several chronic affections, where the blood is found deficient in the lungs as well as in the other organs.

3. On a state of atrophy of the pulmonary parenchyma. This condition of the lung may occur at any age, but is found most frequently in old persons. In these cases, one is tempted at first sight to regard those colourless lungs as models of health ; but, on more attentive examination, we discover that there is a morbid diminution of their density, the place of a certain number of air cells being occupied merely by cellular tissue.

CHAPTER II.

LESIONS OF NUTRITION.

THESE are hypertrophy, atrophy, and trans-
formation. The transformations of the pulmo-
nary parenchyma are not very numerous : the
parietes of the air cells are sometimes converted
into bone ; (an example of which is related,
page 494), and the cellular tissue is occasionally
replaced by fibrous or cartilaginous tissue. The
observations that follow apply principally to the
hypertrophy and atrophy of the pulmonary tis-
sue, on which, as I shall endeavour to show,
several alterations in the form of the lungs
depend.

ARTICLE I.

HYPERTROPHY OF THE LUNG.

THE lung presents two species of hypertro-
phy. In one, there is simply an increase in the
density of its parenchyma, without any altera-
tion of its consistence. In the other, its consis-
tence is likewise increased, or, in other words,
the hypertrophy is combined with induration of
the pulmonary tissue. The first species of hy-
pertrophy appears to me to be the result of an

increase in the number of the septa which serve
to divide the minute ramifications of the bronchia
into the still minuter air cells, at the same time
that there is likewise an increase in the capacity
of these cells. This opinion is supported not
only by the appearance which the lung presents,
but likewise by the circumstances under which
this hypertrophy takes place. Thus, Laennec
has remarked that in several cases where one of
the lungs is incapable of performing its func-
tions, as in effusions of air or fluid into one of
the pleuræ, and especially when one side is con-
tracted, as sometimes happens after the absorp-
tion of a pleuritic effusion, the lung of the sound
side acquires a volume evidently greater than
natural. In all such cases, the tissue of the lung
is remarkably dense and compact, the lung itself
does not collapse when the chest is opened, and
it presents a striking resemblance to the lungs
of children or of horses, which, as I have alrea-
dy stated, possess a much greater degree of den-
sity than naturally belongs to the lung of an
adult man. This species of hypertrophy may
take place in a short time. Laennec saw it par-
ticularly well marked in a man who, six months
before his death, had had a pleuritic effusion fol-
lowed by contraction of the affected side. Its
production results from the fulfilment of a law
in the animal economy, by virtue of which every

double organ becomes the seat of a more active
process of nutrition when its fellow ceases to
act. In this case it is the increased activity of
function which induces the increased activity
in the nutritive process.

Hypertrophy of the pulmonary tissue unac-
companied by any induration properly so cal-
led, presents one variety which merits our at-
tention : I allude to that form of it, where, at
the same time that the parietes of the capillary
bronchia and air cells are thicker than natural,
their capacity is also considerably increased.
This is rendered very evident by inflating and
drying the lung ; for when, after this process, it
is cut into slices, we at once perceive some cells
much larger than in the natural state, and like-
wise some septa much thicker than they usually
are. This form of hypertrophy, which consti-
tutes one of the varieties of pulmonary emphy-
sema, is of very frequent occurrence in persons
labouring under chronic catarrh. In such per-
sons, the dilatation of a certain number of air
cells with hypertrophy of their parietes not un-
frequently co-exists with a diminution of ca-
pacity or even obliteration of other air cells, the
walls of which have increased in thickness at
the expense of the cavity which they surround.
In like manner, hypertrophy of the parietes of
the heart sometimes co-exists with the dilatation,

and sometimes with the contraction of its ca-
vities.

But it is principally in those cases of hyper-
trophy of the lung in which there is likewise
induration of its tissue that the air cells are
obliterated. When a lung in this state is dried
and examined, we perceive a considerable ex-
tent of surface in which not a trace of any ca-
vity can be distinguished ; it appears one solid
tissue, evidently formed of the ordinary septa
increased in thickness and consistence. Here
and there only, a few small cells are to be seen,
the rudiments of the cavities which should na-
turally exist.

The induration of the lung may be accom-
panied by different alterations of its colour.
It very seldom presents a red shade, being much
more commonly either yellow, grey, brown, or
black. The black induration of the pulmonary
parenchyma differs, in my opinion, in no res-
pect from the grey or yellow induration of the
same part, except in colour ; and, as we can
trace all the intermediate shades by which these
different colours pass one into the other, I can
see no reason for supposing the developement
of a new tissue (melanosis), wherever the lung
is indurated and presents a black colour. Why
not as well make an accidental tissue of another
portion of lung which is as much indurated and

impenetrable to air as the preceding, and differs from it only in being yellow or grey instead of black ?

Induration of the pulmonary tissue, though identical in its nature, presents such a difference in its form and appearance, according as it occupies a lobe, a lobule, or only a part of a lobule, that it has been mistaken for different lesions, when in fact the only variety it offered was in the seat it occupied. Thus, Bayle considered the grey induration of some isolated air cells as an accidental tissue, to which he gave the name of *granulation*. The term, as a descriptive one, is certainly correct enough, for these indurated cells resemble exactly so many little grains scattered through the substance of the lung ; but as regards the nature of the alteration, an attentive dissection will readily convince us that the pulmonary granulations of Bayle are neither an accidental tissue *sui generis*, as he thought, nor the first stage of tubercle, as Laennec and Louis supposed, but simply certain vesicles or air cells in a state of induration. Previous to becoming hard and grey, these cells were soft and red ; surely, in this earlier stage of their formation, no person would consider them otherwise than as a cluster of cells in a state of hyperæmia. Few anatomists, I believe, would venture to assert that an entire lobe is changed into an ac-

cidental tissue, because it was at first soft and red, as in pneumonia, and subsequently became hard and grey.   But that which happens in an entire lobe may likewise occur in a few cells; the nature of the lesion is the same, the only difference is, that it is less extensive.

Any one may convince himself of the nature of these pulmonary granulations, by examining them either in a fresh lung, or in one which has been previously dried.   In the latter, the following appearances are presented, provided the lung be healthy in the interval between the granulations.   A number of small round or elongated bodies, of an opake grey colour, present themselves to view.   The pulmonary tissue around them is sometimes perfectly healthy; at other times the parietes of the neighbouring bronchia and air cells are thickened, and present the same greyish colour as the granulations. Several of the cells whose parietes are thus thickened are very much dilated; but in general wherever the thickening of the parietes is considerable, the cells lose their regular form, and their capacity diminishes.   Let us suppose this thickening of the walls to proceed one degree further, we shall then have their cavities completely obliterated, and themselves converted into those homogeneous grey bodies which constitute the granulations.

To recapitulate, pulmonary granulations are formed by a succession of the following alterations :

1. The parietes of the air cells are injected.

2. They become tumid and swoln, but still retain their red colour.

3. They lose their red tinge, and acquire in its stead a grey colour, and at the same time increase progressively in thickness.

4. Whilst the walls of the cells thus increase in thickness, their cavities undergo various alterations : sometimes their capacity is increased, sometimes diminished, and in some instances altogether obliterated, and the granulation is then formed. It is almost needless to remark that, during any of the above stages, the part is liable to ulceration, or may secrete either pus or tubercle. All these appearances may readily be observed by drying a lung containing these granulations, cutting it into layers, and examining them in the sun.

The cellular tissue which isolates the lobules of the lung from each other is sometimes indurated ; this alteration may either be confined to the cellular tissue, or may extend to the lobules which it invests. When in a state of induration, it becomes much more apparent than it usually is, and at the same time acquires a degree of density and hardness equal to that of fibrous

tissue. In this state it is seen forming septa or partitions in the parenchyma of the lung, which resemble so many aponeurotic expansions ; and it sometimes even forms masses of considerable size and thickness, which compress the adjacent lobules, and prevent their dilatation, so that the proper tissue of the lung has a tendency to waste away in proportion as the interlobular cellular tissue is preternaturally developed.   Such is the series of phenomena which occurs in some cases ; but, in others, the hypertrophy of the cellular tissue co-exists with a simple state of induration in the lobules it invests.

Induration of the pulmonary parenchyma may continue for a very long time unaccompanied by any other alteration.   It may, however, be followed by different morbid changes which have often been mistaken for the primary and principal affection, when in point of fact they were only secondary.   In this way, we sometimes observe a few tubercles in the midst of a lobe, the entire tissue of which is in a state of induration ; but their number is so inconsiderable that it is impossible to think they could have been the cause of the extensive induration which surrounds them.   In such cases, the lesion of nutrition first takes place, and the lesion of secretion is but a secondary affection.   I am anxious to insist on this fact, because I think the formation of tubercles in the lungs has been too general-

ly regarded as the principal phenomenon in the morbid alterations of these organs ; as if all the other changes of texture were of subsequent formation and secondary importance. In the same way, I consider the black colouring matter which so often imparts its hue to an indurated lung as merely a secondary phenomenon. The fact is, that this black matter is not, any more than tubercles, the source from whence in many instances originate the morbid appearances found in the dead body, or the symptoms observed during life.

The older anatomists described under the name of ulcers of the lung those cavities which in modern times have been regarded as the product of softened tubercles. This latter opinion is doubtless correct in many cases, but is certainly not so in all. It has repeatedly occurred to me to find a portion of pulmonary parenchyma in a state of induration, and containing one or more ulcerous cavities, when not a single tubercle was to be found in the entire lung, or, if a few were detected, they were very inconsiderable in size and number, and no more proved that the cavity had succeeded to the liquefaction of a mass of tuberculous matter, than the tubercles which are so often found round the edges or at the bottom of intestinal ulcers prove that those ulcers were caused by the softening of a submucous tubercle. Neither is there any reason for supposing that these pulmonary ulcers

were preceded by the formation of an eschar; they may, therefore, be regarded as primitive. Sometimes there is only one ulcer, and sometimes there are several, scattered through the substance of the lung. The induration of the surrounding tissues often precedes their formation, but it may likewise follow as a consecutive affection.

ARTICLE II.

ATROPHY OF THE LUNG.

WHENEVER any cause continues for a certain length of time to impede the free passage of the air into the pulmonary cells, those cells diminish in number, and the parenchyma of the lung falls into a state of atrophy. Accordingly, we find this atrophy invariably taking place in those persons who have had a pleuritic affection of long standing: the same effect is often produced by the presence of tubercles, and likewise by the hypertrophy of the cellular tissue described in the foregoing article. In a preceding part of this work I related a remarkable instance of atrophy of the lung, in a case where the principal bronchial tube distributed to it was almost completely obliterated.

I am inclined to think that the lungs in old

persons sometimes undergo so considerable a
degree of atrophy that their chest is visibly
contracted in consequence.   At least, it is cer-
tain that in several decrepid old men the thorax
is found much less developed in its different
diameters than at any other period of life ; and
in such persons the lungs are small, contain very
little blood, are remarkably light, and their
whole tissue appears rarefied.

In these cases, it is only by the diminution in
the size of the lung, and by the apparent rare-
faction of its tissue, that we can judge of the
atrophy which it has undergone.   But this alter-
ation is capable of demonstration by the follow-
ing procedure.   Let a lung thus rarefied be in-
flated and dried, we then perceive a remarkable
alteration in the disposition of the ultimate
bronchial ramifications, and of the air cells in
which they terminate ; they no longer form dis-
tinct cavities separated from each other by com-
plete septa.   At first, these septa are only
reduced to a state of extreme tenuity ; but at a
later period, some of them appear perforated in
one or more points, while others seem ruptured
and irregularly torn.   In some cases, the walls
of the cells disappear altogether, and we only
find in their stead some delicate laminæ or fila-
ments traversing in different directions cavities
of various sizes.   In the parts of the lung where

these alterations exist, there are no longer to be found either bronchial ramifications, or vesicles, properly so called, but merely cells of greater or less diameter, divided into several compartments by imperfect septa, or irregular laminæ. Many of these cells bear a perfect resemblance to the lung of the tortoise tribe, and they all approach to it more or less, as to a type of organization, towards which the human being in this case seems to descend.

Thus we see how lesions very different in their nature, hypertrophy on the one hand, and atrophy on the other, may both produce in the lung the same effect, namely, the transformation of the minute air cells into large vesicular cavities. But, in the case of hypertrophy, there is only dilatation of the cells without laceration of their parietes, unless as an accidental occurrence ; whereas, in atrophy of the lung, these large cavities are formed by several cells being thrown into one by the thinning and rupture of their walls. Hence arises this important difference, that, in the first case, the number of the surfaces on which the blood is exposed to the action of the air remains the same ; while in the second, the number of those surfaces is considerably diminished. It is easy to see that the respiration will not be equally affected in these two cases ; and that the dyspnœa must necessa-

rily be more considerable in the latter. There is, however, one circumstance which occurs in old persons (in whom, as I have already stated, atrophy of the lungs most generally occurs) which prevents the respiration from being so greatly embarrassed as we might, *a priori*, expect from the diminution that takes place in the number of the surfaces for aerating the blood ; and that is, the diminution in the quantity of their blood, or, what comes to the same thing, the diminution in the rapidity of their circulation. For this reason, atrophy of the pulmonary parenchyma, when occurring in old age, should rather be regarded as a natural phenomenon resulting from the fulfilment of a law in the animal economy which establishes a constant proportion between the quantity of blood to be aerated in a given time, and the extent of the surface on which this aeration is accomplished. For the same reason it is that the lung has its maximum of density in infants, and in those animals which have either a very rapid circulation, or a very large supply of blood ; and that, on the contrary, the density of the lung is at its minimum in old persons, and in such animals as receive into their lungs at each round of the circulation only a small proportion of the blood contained in their circulating system.

However, we do occasionally meet with per-

sons advanced in life whose respiration is greatly disordered, for which no other cause can be discovered than an unusual degree of this atrophy of the pulmonary tissue.

Lastly, this alteration, which may in general be regarded as a natural occurrence in old age, sometimes takes place at an earlier period of life, and is then invariably productive of more or less dyspnœa.

This transformation of the air cells into larger cavities, either by the simple dilatation of each cell, or by the destruction of their partitions, constitutes the lesion described by authors under the name of *Pulmonary Emphysema.*

The theory I have now given of the formation of pulmonary emphysema would be incomplete, if I were not to add, that it is sometimes produced in a manner purely mechanical. In this way it is often formed in horses, in whom emphysema of the lungs is a disease of constant occurrence, and, as I believe, often produced by the violent efforts which those animals are compelled to make. I have repeatedly examined horses' lungs in a state of emphysema, and always found the affection to consist, 1. in a simple dilatation of the minute bronchia and air cells ; 2. in a rupture of their parietes ; and, 3. in an infiltration of air into the interlobular cellular tissue. The first of these alterations appears to precede the second, and the latter, I believe,

never occurs but as a consequence of the others
It is very probable that it is likewise in a man-
ner quite mechanical that emphysema of the
lungs is formed in persons labouring under
old catarrhal affections, attended with violent
paroxysms of coughing. It would be interest-
ing to ascertain whether those persons whose
occupation constantly obliges them to make
great efforts, are not more subject than others
to emphysema of the lungs.*

When the emphysema is not considerable,
it requires a practised eye to recognize it in the
fresh lung ; but the difficulty ceases when the
lung is inflated and dried. I am confident that
in many cases the lungs of asthmatic patients
have been regarded as healthy, when they were
in reality emphysematous, and that in this way
several cases of dyspnœa were set down as es-
sential, for which anatomy has now discovered
an organic cause.

When the emphysema is more considerable,
it may be at once detected by simple inspection.
Sometimes it appears in the form of bullæ,
which project more or less above the external
surface of the lung ; at other times, there is no

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* I have been assured by a physician to the hospital at Fontainebleau,
where a great number of quarry men die who are constantly in the habit of
raising large blocks of stone, that their lungs are frequently found emphyse-
matous. The fact is curious, and deserves to be investigated.

projection on the surface, but underneath the pleura are perceived one or more points where the air cells are converted into large vesicles. In some cases, these vesicular cavities are not perceptible externally, but exist in the interior of the pulmonary parenchyma, where I have often seen them, especially in the horse, forming cavities of considerable size.

CHAPTER III.

LESIONS OF SECRETION.

The same morbid secretions are found in the lung as in all the other organs, but they are not all equally common. Thus, a purulent abscess in the lung is a very rare occurrence, while there is no part of the body in which tubercle and melanosis are so frequently deposited. Whatever be the nature of the morbid secretion, it must be deposited in one of three points; either, 1. in the cavity of the air cells; 2. in their parietes; or, 3. in the cellular tissue interposed between them. Many of them have been already fully described; melanosis, for instance; in treating of which in the first volume, I took occasion to describe whatever particularities it presents when seated in the lung:

to that description I must therefore refer the reader.

Calculous concretions, composed in the lung, as elsewhere, of calcareous phosphate, possess very little interest as an isolated affection : they seldom, however, exist in the lung without some other alteration accompanying them ; indeed, they almost always co-exist with tubercles, of which they appear to be one of the terminations. Their usual situation is in the summit of the lung, where they are sometimes found mixed up with tuberculous matter, in the form of irregular masses, or of fine grains like sand ; in other cases, they are found without any admixture of tuberculous matter, and generally surrounded by the pulmonary parenchyma in a state of induration and of a deep black colour : lastly, they are occasionally found in cavities that are probably the remains of old tuberculous excavations.

The only entozoa which have as yet been observed in the human lungs, are the acephalocysts : they are always found enclosed in cysts, round which the parenchymatous tissue of the lung may either be simply compressed, indurated, or reduced to a state of atrophy. In one case, an entire lobe of the lung was transformed into a large cyst of hydatids ; and in another, which I have elsewhere described, the

acephalocysts were lodged in the interior of the pulmonary veins, which were greatly dilated.*

There are two other alterations of secretion, which, as I have already described I shall now only briefly allude to. One of these consists of a preternatural exhalation of serous fluid into the cellular tissue of the lung. This disease, which Laennec described under the name of *œdema of the lung*, is sometimes idiopathic, but more generally coincides with a general leucophlegmatic state of the system. M. Billard states that he has observed it in newborn infants affected with that peculiar disease, hardening of the cellular tissue. The other alteration consists of an effusion of gas into the cellular tissue that unites the lobules of the lung together. It is this effusion which Laennec described as *interlobular emphysema*. In some cases, it is produced by an exhalation of gas; but, in most instances, the air found in the interlobular cellular tissue is not generated there, but merely extravasated from a ruptured air cell.

There yet remain two morbid secretions to be described, namely, pus and tubercle; these I shall now proceed to describe.

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* *Clinique Medicale,* tom. iii.

§ I. Secretion of Pus.

Pus is found in two forms in the parenchyma of the lungs, either collected into abscesses or infiltrating the pulmonary tissue.

Purulent infiltration, which is by far the more frequent occurrence of the two, may either occupy an entire lobe, or be confined to some isolated lobules. It is in general accompanied by evident traces of the red hepatization already described, and appears in the great majority of cases to succeed to the most violent degree of inflammation. The infiltration of the lung with purulent matter sometimes takes place with great rapidity ; it has been found fully formed in four days after the first symptoms of pneumonia had made their appearance.

The pulmonary parenchyma, when infiltrated with pus, presents a greyish ash colour, and as the second stage of pneumonia has received the name of *red hepatization*, so this in contra-distinction has been termed the *grey hepatization*. When a lung in this state is pressed, the purulent fluid exudes in greater or less quantity ; and when it is all squeezed out, the lung frequently re-assumes the red colour and hepatized appearance of the second stage, thus proving unequivocally that the grey hepatization differs only from the red in having its structure

infiltrated with pus. The consistence of the lung is considerably diminished in these cases ; it breaks down readily when handled, and in some instances is so extremely soft, that the slightest touch is almost sufficient to reduce it to a greyish pap, in which not the least trace of organized structure can be detected. Indeed, you may even squeeze all the purulent matter towards one point, and thus form an abscess in the dead lung.

When we examine with a lens a lung in the state of purulent infiltration, we obtain the following results.

In some cases the surface under examination presents an innumerable multitude of minute grey granulations, of similar form and size, closely pressed together. These granulations cannot, I conceive, be considered in any other light than as the air cells altered in that peculiar manner we have already described in the red hepatization, the only difference being that, in this case, they are grey instead of red. In other instances we only observe a smooth surface without any granular appearance ; which probably arises from the granulations not being sufficiently developed, or else from their being so closely crowded together as to run one into the other, and thus form a uniform surface. Lastly, in those parts, where

the lung appears to the naked eye deprived of
its consistence, and, as it were, macerated in
pus, the magnifier shows us that the structure of
the parenchyma is completely broken down,
and converted into a reticulated cellular struc-
ture, the meshes of which are large and filled
with pus.

The arteries and veins leading to the infil-
trated points usually continue free from disease;
in some cases, however, they are implicated, and
are even sometimes the principal seat of the
suppuration.   Thus, in a case which I exa-
mined with M. Reynaud, where some of the pul-
monary lobules seemed to be in a state of puru-
lent infiltration, on closer examination we found
the principal branches of the pulmonary artery
filled with blood mixed with pus, the smaller
branches were filled with pure pus, and were
easily traced running into all the diseased lo-
bules; indeed the appearance of purulent infil-
tration which they presented seemed principally
to depend on this state of the minute branches
of the pulmonary artery.

There are in like manner certain cases of
red hepatization, which on close examination
we can distinguish from the more ordinary form
of this alteration; for, when cut into, the ori-
fices of the divided bronchia, instead of being
obliterated, as in the ordinary form, remain

open, and seem even more dilated than usual, but the blood-vessels are plugged up with co-agulated blood.   Let us suppose this blood deprived of its colouring matter, and its ordinary degree of consistence diminished, and we shall then have the morbid alteration described in the preceding paragraph ; is it not reasonable, then, to conclude, that these two states are merely different degrees of the same morbid alteration ? And if we suppose the fibrine, instead of being perfectly liquefied, as in the preceding case, to lose only a part of its consistence, shall we not then have, instead of purulent infiltration, an apparent infiltration of tuberculous or encephaloid matter ?

A collection of pus formed in the parenchyma of the lung, so as to constitute a genuine abscess, is an extremely rare morbid appearance.   It is strange how Laennec, who was perfectly aware how rare a phenomenon it is in the dead body, could have been led into the error of describing it as a common occurrence in the living subject.   He states that in one year he ascertained the existence of twenty abscesses of the lung : surely this must have been a mistake.

M. Sestier, resident pupil at the *Hôpital des Enfans-Trouvés*, showed me the lung of a new-born infant, which contained several large abscesses : they had no resemblance whatever to

tuberculous excavations. I believe that no such appearance has ever been observed at any other age.

It is not only as the sequelæ of inflammation that abscesses are formed in the lung; they likewise occur, and perhaps even more frequently, in cases where the lung seems merely to receive into its tissue a certain quantity of pus which had been formed in some other part, and was only conveyed thither by the torrent of the circulation. Collections of purulent matter have of late years been frequently found in the lungs after capital operations, the pulmonary tissue all round appearing perfectly healthy. Similar collections have likewise been found in persons who had one or more organs at a distance from the lungs in a state of suppuration. Sometimes, in these cases, instead of an abscess we find a certain number of pulmonary lobules in a state of purulent infiltration.

From an attentive examination of these cases, I am disposed to range them in two classes. In one, it appears that the pus is formed in the torrent of the circulation, or is introduced into it from some organ in a state of suppuration, and in its passage through the parenchyma of the lung is separated as through a filtre, and is either collected into an abscess, or infiltrates the pulmonary tissue. Is it not by a

similar process that mercury injected into the crural vein of a dog traverses the whole circulating system until it arrives at the lung, where it abandons the circulating fluid? In the other class of cases, some cause with which we are unacquainted alters the blood, coagulates it in the pulmonary vessels, and transforms it into purulent matter in the smaller branches of these vessels. I have dwelt particularly on these facts, because they prove, in conjunction with several others, that the cause of the suppuration of an organ is not always to be found in the organ itself; and, consequently, that the simple fact of pus being found in an organ, is not of itself sufficient evidence to prove that inflammation must necessarily have been going forward there.

§ II. *Secretion of Tubercle.*

According to most modern authors, the developement of tubercles in the lungs constitutes the anatomical character of pulmonary consumption. Bayle gave this term a wider signification, and applied the name of phthisis to the disease dependant on any alteration of the lung that is usually followed by ulceration. In conformity with this idea, he admitted six different species of phthisis.

1. Tuberculous phthisis.
2. Granular phthisis.
3. Phthisis from melanosis.
4. Calculous phthisis.
5. Cancerous phthisis.
6. Ulcerous phthisis.

This classification of Bayle's is objectionable in many respects. As the term phthisis, taken in this extensive signification, only served to represent a train of symptoms which might result alike from the most different alterations of the lung, Laennec thought it would be beneficial to the interests of science to restrict its application to one of those alterations exclusively ; and accordingly the term phthisis is only applied by him to that morbid state which is produced by the presence of tubercles in the lungs ; and in this acceptation the term is now generally used.

The general history of tubercles has already been given in the first volume; I shall therefore at present only describe the peculiarities they present when seated in the lung. In this, as in every other organ, they first appear as small, white, friable masses, which sooner or later become soft, and then tend to be eliminated from the lung, leaving behind them an ulcerous cavity, which generally spreads more and more, in some instances remains stationary, and in a very small proportion of cases fills up and cicatrizes.

It is rare to find only one tubercle in a lung ; and it is also rare to find them in one lung, and not in the other. Both these cases have, however, been observed. It is in the upper lobes that tubercles have the greatest tendency to be developed, where, according to M. Broussais, inflammation of the bronchia is also most common. In some cases, they are formed in the interior of the lung ; in others, they are quite superficial, and situated immediately under the pleura, which they sometimes irritate and perforate.

When once a tubercle is developed in the lung, it may either be converted into a calcareous concretion productive of little or no inconvenience to the system, or it may soften, and be transformed into a cavity. The dimensions of these cavities are very variable ; some are scarcely large enough to contain a nut, and others are so vast as to occupy the place of an entire lobe. In some cases, there is only one cavity ; in others there are several, which may either remain isolated, or communicate by fistulous passages. Some are situated at a distance from the surface of the lung ; others again are so superficial, that they are only separated from the pleura by a thin transparent layer of the pulmonary parenchyma. The pleura which covers these superficial cavities is in almost every in-

stance united to the corresponding surface of the pleura costalis by cellular adhesions, which prevent the parietes of the cavity collapsing, as they do in the dead body when these attachments are removed. It occasionally happens that the cavity advances still nearer to the surface, reaches the pleura, and perforates it. In some cases this accident is not productive of any inconvenience, as the contents of the cavity are prevented from escaping into the sac of the pleura by the adhesions which surround the perforation, and bind the lung to the ribs. But, in general, the most fatal consequences follow ; for, the moment the wall of the cavity is ruptured, its contents are poured into the cavity of the pleura, pneumothorax immediately ensues, and subsequently an effusion of fluid from the pleura. A very small cavity, provided it be situated near the surface of the lung, may give rise to this accident, which generally proves fatal in a very short time, though in some cases the patient has lingered as long as thirty days.

The interior of tuberculous cavities is generally traversed by bands attached at both extremities to the sides of the cavity. These bands contain some pulmonary tissue in a state of induration, and blood-vessels generally transformed into impermeable fibrous cords. In some rare cases, however, these vessels continue per-

meable, and by their rupture occasionally give rise to attacks of hæmoptysis. The substance of the lung around the cavities is sometimes healthy, sometimes filled with tubercles in different stages, and sometimes indurated and of a grey or black colour. The walls of these cavities are generally formed by the parenchyma of the lung, either naked, or else covered only with an unorganized membraniform layer, apparently composed of the most concrete part of the purulent matter contained in the cavity. It is only under certain circumstances to be presently described that these walls are ever lined by fibrous or cartilaginous membranes. Their internal surface presents one or more openings by which the interior of the cavity communicates with the bronchia, and which are in fact formed by the perforation of these tubes. A number of vessels creep along the sides of the cavity, but, unlike the bronchia, they almost always remain whole and uninjured.

The matter contained in tuberculous cavities is not always of the same description. Most commonly it is a whitish or greyish purulent fluid, in which are suspended a number of cheesy particles resembling the debris of tubercles. In other cases it is a homogeneous pus, variable in its colour and consistence. Blood, also, has been found in them, both fluid and

coagulated ; and I have myself seen fragments of the pulmonary parenchyma, totally detached and floating loose in the interior of the cavity. Lastly, calculous concretions are occasionally found in the cavities loose and unattached. Are these concretions formed there, or have they been detached from the surrounding parts of the pulmonary tissue ?

The cavities are not formed by the tissue of the lung being forced back and condensed ; the parenchyma is really destroyed, and a true ulcer formed, which goes on constantly increasing in size, until its dimensions far exceed those of the original tuberculous mass.

The older pathologists were of opinion that these ulcers were susceptible of being cicatrized. In our days, the possibility of their cicatrization was at first positively denied, until the accurate researches of Laennec fully established that the opinion of the ancients was founded on fact, and that the cicatrization of tuberculous cavities does actually take place, though unfortunately in but a small proportion of cases. The following are the results of what has been observed on this subject.

When a tuberculous cavity evinces a disposition to heal, the limits of the ulceration are marked by the appearance of a cellulo-fibrous membrane lining its walls ; at the same time the

purulent secretion ceases, and is replaced by the exhalation of a clear serous fluid. This, which may be considered as the first step in the sanative process, is soon succeeded by another, in which the cellulo-fibrous membrane changes its character ; the fibrous layer grows thicker, and manifests a tendency to become cartilaginous ; and the cellular layer assumes the appearance of the mucous membrane lining the bronchia, and becomes continuous with it. The sanative process does not, however, stop there. Sometimes the sides of the excavation become agglutinated, and its cavity so completely obliterated that the only trace which remains of it is a cellulo-fibrous line, into which several large bronchial tubes run and terminate abruptly. Sometimes again the fibrous or cartilaginous layer developed round the excavation increases in thickness, and is transformed into an amorphous mass which fills up the cavity. Lastly, it appears that, under certain circumstances, the excavation is filled up by an accumulation of phosphate of lime ; at least cases have been recorded of persons who, after presenting the most unequivocal signs of a tuberculous excavation, and subsequently recovering, were found to have only a mass of calcareous phosphate in the situation where pectoriloquy and *gargouillement* had before been distinctly audible.

These different traces of the obliteration of tuberculous cavities have been chiefly observed under the following circumstances.

1. In cases similar to the preceding, where, at some previous period of their lives, the individuals had suffered from a violent pulmonary attack which had been universally considered as phthisis.

2. In cases where persons, after recovering from disease of the chest, were again seized with a similar attack, and died of it.

3. In cases where, from the commencement of the pulmonary attack, the patients grew every day worse and worse. In these cases it would appear that as fast as one cavity was cicatrized, another was formed.

Hence we see, that after the cicatrization of a cavity, the disease may still continue its progress by the formation of new tubercles and new cavities, or be suspended for a time, or lastly undergo a perfect cure and never return.

The marks of cicatrization have as yet only been found in the situation where these cavities most frequently occur, namely, in the summit of the lungs, which in all such cases is depressed, shrunk, and puckered: the depression on the surface corresponding to the loss of substance in the interior of the lung is filled up by packets of false membrane, or else the parietes of the

thorax give in, in order to accommodate them-
selves to it.

An interesting point in the history of tuber-
cles is, whether they may be absorbed while
still in a state of crudity, or whether they must
first be softened and transformed into abscesses
before they can be removed from the lungs.
The question still remains to be decided ; how-
ever, the following observations may throw some
light on the subject.

I have sometimes been struck, when examin-
ing tuberculous lungs, with the singular form
which some of the tubercles presented ; at one
side they retained the usual rounded form, but
at the other they seemed to terminate in a sort
of caudal prolongation traversed by a deep
groove. These tubercles were in the neighbour-
hood of several large bronchia. When examin-
ing these tubercles it struck me that they might
originally have been, like other tubercles, of a
rounded form ; and that subsequently their cen-
tral portion might have disappeared, either by
absorption, or by passing molecule by molecule
into the neighbouring bronchia ; the conse-
quence of which would be the approximation of
the parts not yet absorbed ; and in this way
might be explained the transformation of the
rounded into an elongated body, and the forma-
tion of a groove in its centre. These hints are

only offered to induce others to pursue the investigation.

The substance of the lung round the tubercles may be differently affected.

1. It is sometimes perfectly healthy ; this is frequently the case where the tubercles are still in a state of crudity, but occurs more rarely when they are already softened, or converted into cavities.

2. The pulmonary parenchyma may be emphysematous : this emphysema may either be produced by the dilatation of the air cells in the vicinity of the tubercles, thus establishing a supplementary respiration, or it may proceed from the atrophy and rupture of the walls of these cells.

3. The parenchyma of the lung may be rendered impermeable to the air by the induration and thickening of the parietes of the air cells, or by its infiltration with serum, or with gelatinous fluid. Laennec was of opinion that the induration of the pulmonary parenchyma in the neighbourhood of tubercles was produced by the infiltration of the tissue of the lung with the tuberculous matter ; and he attributed to this infiltration its impermeability to air, grey colour, and hardness : but these phenomena are much more satisfactorily explained by referring them to an extreme degree of induration and thickening of the pulmonary parenchyma. What analogy

is to be found between the matter of tubercle
and the gelatiniform infiltration which frequent-
ly exists round tubercles ? none ; and yet Laen-
nec described it as a species of tuberculous in-
filtration, under the title of *infiltration tubercu-
leuse gelatiniforme.*

The induration of the tissue of the lung in
many cases does not commence until long after
the formation of the tubercles, when they begin
to soften and form abscesses : in some cases,
however, it precedes the deposition of the tuber-
cular matter, and, instead of being regarded as
an effect, must in these cases be considered as
at least an occasional cause of their develope-
ment.   What other conclusion can we come to
in those cases where an entire lobe is found in-
durated and impermeable to air, with only a
few miliary tubercles dispersed through its sub-
stance ?   Or, when (as still more frequently
happens) several lobules are gorged with blood
and infiltrated with serum, and a few tubercles
are found in some of the diseased lobules, and
none in others, is it possible to suppose that the
diseased state of the lobules was produced by
the presence of the tubercles ? or is it not more
reasonable to suppose that the disease of the
lobules preceded the formation of these tu-
bercles.

If we infiltrate and dry a lung containing

tubercles, the parenchymatous tissue around them being apparently healthy, and after drying slice it into layers, we observe certain air cells whose cavity is dilated, and whose parietes are considerably thickened, and present a peculiar yellow tinge ; in some points this thickening becomes more considerable, and the yellow tinge deeper ; and in others we are enabled to distinguish in these thickened parietes a number of minute yellow round bodies, which are evidently tubercles. Here, then, we find certain lesions preceding the secretion of tubercles. But, in order fully to investigate this question of the etiology of tubercles, it would be necessary to examine the influence of every circumstance, whether internal or external, which is capable of promoting their developement. Such an inquiry, though exceedingly interesting in itself, would be inconsistent with the design of this work, in which I do not undertake to solve the question of the nature and causes of disease, but merely to show how far pathological anatomy can aid us in the solution of that question. From it we learn, that in those parts of the lung where tubercles are developed, we sometimes find no appreciable deviation from the healthy state ; that, in some cases, the lesions we observe can only be considered as effects produced by the presence of tubercles ; and lastly, that, in

certain cases, and those not the least numerous either, the morbid alterations of the lung were evidently prior to the formation of the tubercles, and contributed to produce them. These alterations which precede the developement of tubercles are chiefly the following :

1. Hyperæmia of the bronchia of a certain size.

2. Hyperæmia of the air cells and ultimate ramifications of the bronchia, without obliteration of their cavities.

3. Hyperæmia of the same parts, with considerable thickening of their parietes, and obliteration of their cavities.

4. An effusion of blood into the tissue of the lung ; the blood thus effused coagulates, becomes a living part, and secretes tubercle.

Professor Cruveilhier has lately instituted a very interesting set of experiments on the different phenomena produced by injecting mercury into the blood-vessels ; and has ascertained that by injecting this metal into the femoral artery of a dog, he caused the formation in the cellular tissue of a great number of small, white, round bodies, containing each a globule of mercury in its centre surrounded with a concrete cheesy pus. When the mercury was injected into the bronchia, the same results were obtained, white granular bodies, composed of

concrete purulent matter, with a globule of mercury in their centre, were formed in the parenchyma of the lung, where they appeared to occupy chiefly the ultimate divisions of the bronchia and the air cells.   M. Cruveilhier thinks that he has in this way artificially produced the formation of tubercles.   These experiments have since been repeated by Dr. Lombard, whose interesting researches on the subject of tubercles I have already repeatedly alluded to.   I have dissected with him the lungs of several animals into whose bronchia mercury had previously been injected, and the following were the appearances we discovered.   The mercury contained in the small bronchia was enveloped in a thick layer of puriform mucus, fluid in some points, and in others of the consistence of the false membrane of croup.   In several places, the parietes of the bronchia were ruptured, and the mercury was effused into the substance of the lung and surrounded with purulent matter. These were the only appearances we observed, although the animals were examined at different dates after the experiment.   I have no doubt, if these experiments were conducted on a larger scale, that genuine tubercles would be found in the lungs of some of the animals ; but I should be inclined to regard them in such cases as the product of a peculiar disposition brought into

action by the irritation artificially created in the bronchia.

Persons who die with tubercles in their lungs present on dissection various lesions, some of which are purely accidental, while others co-exist so frequently with the developement of tubercles in the lungs, that it is reasonable to suppose there exists some connexion between them.

The most remarkable of these lesions is the formation of tubercles in a number of organs which have no connexion with the lung either in their structure or functions. This simultaneous developement of tubercles in several organs occurs more particularly in children ; it is also very remarkable in animals from warm climates that die in our country.—(See the chapter on *tubercles* in the first volume.)

The several lesions which co-exist with the developement of tubercles in the lungs, are to be found either in the organs of respiration or in other parts.

The lesions of the organs of respiration reside :—

1. In the larynx, which is rarely, if ever, found in a state of ulceration, unless where there are tubercles in the lungs.

2. In the trachea, in which the redness and ulceration are sometimes confined to the side

corresponding to the lung in which the tubercles are most numerous and farthest advanced.

3. In the bronchia, which, though generally red and inflamed, are sometimes remarkably pale, and present a striking contrast to the extent of disease existing in the parenchyma of the lung.

4. In the parenchymatous substance of the lung round the tubercles : these lesions have already been enumerated.

5. In the pleura. In almost every case of tubercles, adhesions are formed between the pleura costalis and pulmonalis. These adhesions are the more firm, as the disease is more advanced, and they are always strongest towards the summit of the lung. Some phthisical patients are taken off by an attack of pleuritis terminating in effusion, and others by pneumothorax caused by the opening of a tuberculous cavity into the pleura.

The parts of the body not connected with the organs of respiration usually present the following appearances in phthisical persons.*

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* Louis, *Recherches sur la Phthisie pulmonaire* ; and my *Clinique Médicale.*

A. *State of the Circulatory Apparatus in Phthisis.*

Increased size of the heart is a rare phenomenon in persons labouring under phthisis. In one hundred and twelve cases M. Louis only saw three instances of it. On the other hand, diminution of the heart's size is very common; it may exist with or without thinning of the parietes. The aorta is likewise often diminished in size.

A great deal has been said of the alterations of the lymphatic system in consumptive patients; but these remarks have in general been founded on theory rather than observation. The supposed alterations of the lymph itself are not supported by a single fact; and as to the lymphatic vessels, the only lesion which has been observed is that some of them occasionally contain tuberculous matter. The lymphatic ganglions are much less frequently diseased than is generally supposed; for, in a large proportion of the adults who die of tuberculous affection of the lungs, there is no appearence whatever of disease in them : in children, indeed, they are oftener diseased, and not unfrequently contain tubercles.

There is nothing very particular in the appearance of the spleen in phthisical patients,

B. *State of the Digestive Apparatus in Phthisis.*

This apparatus is decidedly the one most frequently affected in consumptive persons. Softening of the mucous membrane of the stomach, hyperæmia of the different portions of the intestines, ulceration of the small intestine, accompanied in many instances by a developement of tubercles, are all of such frequent occurrence in phthisis, that they may be fairly considered as constituent parts of the disease. These lesions may either precede or follow the formation of tubercles in the lung ; and in some cases the pulmonary and abdominal affections set in together.

It has been stated that *fistula in ano* is a frequent complication with tubercles in the lungs. The result of my observations does not confirm this assertion.

E. *State of the Secretory Apparatuses in Phthisis.*

The cellular tissue is deprived of its fat : it is very rarely infiltrated with serum. It is also rare to find effusions in any of the serous cavities. In almost every case, as already stated, the pleura becomes irritated, and covered with false membranes, which frequently secrete tubercular matter. Perforation of the in-

testine occasionally produces inflammation of the peritoneum.

The fatty degeneration of the liver was observed by M. Louis in a third of all the phthisical patients whom he examined ; and out of forty-nine cases of fatty liver which he met with in his dissections, forty-seven were cases of phthisis. Hence he concludes that this morbid alteration, so common in phthisical patients, belongs almost exclusively to them. The liver is never found in this state until after the tubercles in the lungs have been softened, and transformed into cavities.

This fatty degeneration is the only morbid change which the liver can be said to exhibit in phthisis. The only cause of jaundice I ever observed in this class of patients was in a case where I found the biliary ducts compressed by masses of tubercle. There is nothing peculiar in the colour of the bile ; biliary calculi are exceedingly rare in those cases.

M. Louis found the urinary organs healthy in three-fourths of the phthisical patients whom he examined. In the other fourth there were a variety of lesions, but none of them seemed peculiar to phthisis. The result of my own observation is likewise that the urinary organs are seldom diseased in consumptive cases.

D. *State of the Nervous Apparatus in Phthisis.*

The only peculiarity which the nervous system presents, is, that in this, as in other chronic complaints, it is generally paler and softer than natural. The functions of the brain are seldom deranged ; sometimes, indeed, there sets in shortly before death a state of delirium, but I do not think it can be accounted for by any appreciable lesion of the cerebral organs.

E. *State of the Apparatus of Locomotion in Phthisis.*

There are very few diseases in which the muscles become so completely atrophied as in pulmonary consumption. They seldom, however contain tubercles. The opinion lately promulgated by M. Larcher, that, in phthisis, the bones contain a less proportion of phosphate of lime, seems to me merely conjectural ; at least it needs confirmation.

Experience has shown that there is a frequent connexion between the developement of tubercles in the lungs and white swellings of the joints.

The lesions which we have now enumerated may all be referred to three principal sources.

1. To the same cause which originally pro-

duced the tubercles in the lungs.   This cause reveals itself by the developement of tubercles in other organs as well as in the lungs, and by the usual train of symptoms which characterize the scrofulous diathesis.   The ancients were well aware of the existence of this constitutional taint ;   and accordingly they divided phthisis pulmonalis into the *congenital*, and the *acquired*.

2. To the alteration in the process of sanguification which must necessarily take place in every instance where the lung, filled with tubercles, becomes impermeable to the air through the greater part of its extent.

3. To the repetition of the pulmonary hyperæmia in different organs.

CHAPTER IV.

Lesions of the Innervation of the Lungs.

WE have now enumerated all the morbid appearances which have as yet been observed in the organs of respiration.   There are, however, certain diseases which cannot be referred to any of these alterations of structure, and can only be explained by attributing them to some derangement of that portion of innervation which regulates and presides over the functions of the respiratory organs.   Let us take the hoop-

ing cough for example : Can the phenomena of this disease be explained by the morbid appearances which we find on dissection ? Decidedly not ; inasmuch as nothing can be more variable than these appearances. In some children, a slight redness of the trachea or bronchia is the only morbid appearance to be discovered ; in others, the bronchia are dilated, and their parietes either hypertrophied or thinner than natural ; in others we find emphysema of the lungs ; in others, again, tubercles, either scattered through the substance of the lung, or else accumulated round the principal bronchia. In two cases, M. Breschet found the pneumo-gastric nerves red and tumefied ; but no such appearances were ever found by M. Billard, who frequently examined the nerves of the eighth pair in hooping cough, without being able to discover any appearance of disease in them.

Of all these different morbid appearances, there is not one which can be considered as the cause of hooping-cough. Some are purely accidental ; others exist in every species of catarrhal affection ; whilst a third set appear to be rather the effects of the disease than its cause. To this class belong emphysema and dilatation of the bronchia, which are in all probability produced by the violent efforts made during the fits of coughing.

There are other coughs still more decidedly

dependant on some modification of the nervous influence ; as an instance of which I may adduce the extraordinary varieties of cough we so frequently observe in hysterical females.

There are also several modifications of the voice which can only be accounted for by the influence of the nervous system.   How often do we see persons, when violently agitated, lose the natural tone of their voice, or even become perfectly incapable of speaking !   How else than by the disordered action of the muscles of the larynx can we account for those piercing cries uttered in paroxysms of hysteria ?   There is, in fact, in these cases, convulsion of the muscles of the larynx, as well as of the extremities ; and from their convulsive spasm arises the sudden sense of suffocation which the hysterical patient refers so distinctly to the larynx.

Notwithstanding the efforts which modern anatomists have made to refer all cases of dyspnœa to an organic cause appreciable on dissection, there still remain several which they have not been able to trace to any alteration of structure, and which must in consequence be referred to a modification of the innervation ; or, in other words, there are certain cases of dyspnœa which must be regarded as nervous diseases.*

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* I have related in my *Clinique Medicale* several cases of fatal dyspnœa, some of which could not be accounted for by any organic lesion, and others

Our knowledge of physiology would lead us to
this conclusion, even though we had not arrived
at it by the examination of symptoms, and the
result of dissections ; for it has been long ascer-
tained that, when the par vagum is divided be-
low the laryngeal branches, the transformation
of venous into arterial blood is at once deranged
and soon ceases altogether.

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which were produced by a cancerous tumour that had compressed and dis-
organized the pneumo-gastric nerves. In one of these cases, the patient pre-
sented the usual symptoms which characterize organic disease of the heart.

SECTION III.

THE THYROID GLAND.

THE morbid alterations which have been observed in this organ are the following.

1. Acute tumefaction of its substance, produced either by an accumulation of blood in its vessels, or by an infiltration of serum into its tissue. A similar swelling is sometimes produced by making a very violent exertion, in which case it generally comes on suddenly. It likewise supervenes as an acute affection, though not so rapidly, from the use of improper diet. M. Coindet of Geneva mentions the circumstance of a regiment, composed of young recruits, who were almost every man attacked with considerable enlargement of the thyroid, shortly after their arrival at Geneva, where they all drank water out of the same pump. On their quarters being changed, the thyroid soon regained its natural size in every instance.

2. Enlargement from hypertrophy of its substance. This hypertrophy may be so very considerable as to produce a lobulated tumour occupying the entire throat, or even descending

in front of the chest, and sometimes causing great difficulty of breathing. This hypertrophy of the thyroid may appear an alteration of structure of but little importance to the mere anatomist ; but to the scientific inquirer, who investigates the causes of disease as well as its effects, it is a phenomenon of very considerable interest; for he views it not as a mere local lesion, but as connected with a profound modification of the whole constitution, and as produced under the influence of certain causes which operate on entire populations, and in many countries render this affection endemic.

3. Enlargement from the developement of accidental productions in its interior. These productions are very varied. Some are fluid ; such are those substances like serum, honey, jelly, or suet, which sometimes infiltrate the substance of the thyroid, and are sometimes contained in distinct cells. Solid productions are likewise formed in it, the principal of which are fibrous tissue, cartilage, and bone. I have seen the thyroid transformed into a cyst with osseous parietes, and filled with a substance like honey. The cells and cysts filled with gelatinous fluid so often met with in the thyroid, I consider as merely an exaggeration of its natural structure, which consists of a number of granules containing a viscid fluid. The first

effect of hypertrophy is to render these granulations more manifest, and to transform them into simple vesicles ; their texture becomes subsequently modified, and at the same time the fluid which they secrete is altered in its sensible qualities.

4. Enlargement from scirrhous degeneration. This occurs more rarely than any of the preceding alterations.

The different lesions which we have now enumerated are generally confounded together under the generic name of *goitre :* but, as many of them are essentially different in their progress and termination, it is scarcely possible that the same plan of treatment should be equally applicable to them all. Thus, iodine, which has lately been extolled as a specific in goitre, cannot possibly cure with equal facility all the different varieties of this affection ; and though it may succeed in reducing to their natural dimensions, those enlargements of the thyroid which are caused by hyperæmia, or hypertrophy, or even by the infiltration of serous, melicerous, or gelatinous fluids, it is not probable that it can be equally efficacious in dissipating those goitres or bronchoceles which are principally composed of osseous or scirrhous matter. Another source of error in the diagnosis, and consequently in the treatment of this disease is,

that tumours produced by the thickening of the surrounding cellular tissue, or the enlargement of the lymphatic ganglions seated in its neighbourhood, have often been mistaken for enlargements of the thyroid itself.

SECRETORY APPARATUSES.

EVERY secretory organ may be reduced to a surface of greater or less extent, whereby a fluid is separated from the blood. When this surface is of small extent, it presents a plane surface; when more extensive, it generally becomes concave, and forms a cavity. Sometimes it presents only one of these cavities; and sometimes they became more numerous, and are elongated into canals, without, however, ceasing to terminate each in a *cul-de-sac.* This last arrangement is evident in the inferior orders of animals, in which certain secretory organs, that form in man a homogeneous mass, lose the parenchymatous appearance, and consist merely of an assemblage of canals closed at one extremity, as in the liver of insects; or even of a single duct much convoluted, as in the testicle of the *ascaris lumbricoides.*

The knowledge of these facts may be of some importance in throwing light upon the mode of formation of the organs of secretion, and the nature of many of their morbid states.

In the first volume, I have alluded to the influence of external agents in modifying the secretions; and also to the influence which the alteration of the simplest and apparently least important secretion may exert upon the whole system. In this way are produced whole classes of diseases, on the cause or origin of which morbid anatomy affords no information whatever. Nay more, the very organ whose secretion has been deranged, may appear after death free from any appreciable alteration. Who could tell, for instance, from examining the body of a person who had died of phthisis, that his skin used to be bathed in a profuse sweat every day?

I have already stated, likewise, that the various secretions can only be separated from the blood in particular organs, adapted to the purpose; the only exception to this law being the perspirable fluid, which is formed wherever there exists a particle of matter endowed with life. But, as this fluid is principally formed in the cellular tissue and serous membranes, its exhalation appearing to be their chief function, I have judged it right to class the diseases of those parts among the diseases of the organs of secretion. However, as I have treated of their principal alterations in my first volume, I shall merely give a rapid sketch of them here. I do

not intend, either, to touch upon the diseases of
the follicles ; as they could not well be separated
from those of the tegumentary membranes.   I
shall therefore at present only give a detailed
account of the diseases of the glandular organs
properly so called.

SECTION I.

DISEASES OF THE APPARATUSES SPECIALLY ADAPTED TO THE SECRETION OF THE PERSPIRABLE FLUID.

(The Cellular Tissue, and Serous Membranes.)

THE cellular tissue, considered apart from the organs of which it forms the framework, and in which it seems to be the origin of so many various alterations both of nutrition and secretion, presents lesions that differ in no respect from those of the serous membranes. In fact, what is a serous membrane but a large cell of cellular tissue?

In each, various morbid alterations may occur, either in the solids of which they are composed, or in the fluid which they contain. The serous membranes are much less frequently altered in their own proper tissue, than in the cellular layer that lines their external surface.

CHAPTER I.

Lesions of the Secreting Tissue.

In the greater number of cases where the morbid productions in the interior of a serous cavity bear witness to the morbid state of the membrane, its tissue presents no appreciable lesion. It is but very seldom we discover in it a few red vessels, and it is also seldom found thickened; it somewhat more frequently appears softened and friable.

In many cases where the serous membrane does not present any lesion, the subserous cellular tissue is more or less injected, a circumstance which frequently, but not constantly, co-exists with a morbid effusion into the serous cavity. In others, instead of mere injection, it presents extravasations and ecchymoses, which sometimes appear to be connected with active hyperæmia, and sometimes seem to result from an obstacle to the venous circulation.

The subserous cellular tissue is also occasionally the seat of certain alterations of nutrition. Thus, it sometimes becomes thickened and indurated, and then appears beneath the serous membrane as a white or greyish layer of considerable density, which grates under the scalpel, and, when it has attained a certain de-

gree of induration, perfectly resembles the *scirrhous tissue* of authors.   This alteration is similar to that we have already examined in the submucous cellular tissue, and which is also observed in the subcutaneous and intermuscular; in fact, wherever there exists free cellular tissue. In these various parts the lesion is the same, and yet different names have been given it; what has been called *scirrhus* in the stomach, being refused that appellation in the subserous or subcutaneous cellular tissue.

Instead of becoming simply indurated, as in the preceding case, it has often a tendency to change its nature, and be transformed into fibrous or cartilaginous, and eventually into osseous tissue.   These transformations have been found on the external surface of all the serous membranes.   Thus, a great part of the convex surface of the cerebral hemispheres has been found covered with a cartilaginous or osseous plate; and similar plates have been observed in the falx cerebri and tentorium cerebelli.   In the vertebral canal, the subarachnoid cellular tissue in contact with the spinal cord is sometimes studded with white spots of an osseous, but more frequently of a cartilaginous consistence.   The pleura costalis has been found separated from the ribs for a great part of its extent by a cartilaginous or osseous membrane;

and when the lung has been thrust back towards the vertebral column by a pleuritic effusion, it is not uncommon to find it confined by a layer of an osseous or cartilaginous substance, which would oppose an insuperable obstacle to its resuming its former bulk, even though the effusion were to be absorbed. Cartilaginous or osseous plates are also sometimes interposed between the tissue of the heart and its investing serous membrane ; and the white spots that are not unfrequently observed on its exterior are likewise situated in the subserous cellular tissue.

Cartilaginous or osseous transformation does not occur with equal frequency in every part of the subperitoneal cellular tissue. I am not aware that it has ever been observed in the cellular layer between the peritoneum and the alimentary canal, except in cases of hernia; but it is by no means uncommon around the spleen, on the upper surface of the liver, and the lower surface of the diaphragm. Most of the cases of osseous transformation of that muscle mentioned in authors, appear to me to be merely cases in which one or other of its surfaces was lined with a layer of osseous matter.*

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* Dr. Tavernier informed me that, in the body of a man aged sixty, that was examined by M. Goupil and himself, they found in the substance of the right portion of the diaphragm an osseo-cartilaginous plate, of an irregularly

Lastly, the same transformation has been observed in the tunica vaginalis testis. The subserous cellular tissue is likewise the seat of several alterations of secretion, of which the following are the principal.

1. An accumulation of blood, which is sometimes inconsiderable, and does not appear to have produced any unpleasant symptoms during life ; at other times the hæmorrhage is so extensive as to constitute a serious disease or even cause the death of the patient ; thus, some cases of apoplexy are owing to an effusion of blood into the subarachnoid cellular tissue of the convex surface of the hemispheres.

2. An effusion of serum around the cerebral hemispheres. This, when at all considerable, raises up the arachnoid and must tend to compress the brain. It has sometimes a gelatinous appearance, and sufficient consistence not to flow out on an incision being made into the arachnoid. We must not, however, forget, that a fluid naturally exists round the brain and spinal cord, the importance of which has lately been proved by Magendie's experiments. This

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quadrilateral form, and of from three to three and a half inches in extent, which was capable of being detached from the pleura and peritoneum, and was evidently formed at the expense of the muscular and fibrous tissues of the diaphragm, of which no trace remained in that part.

is not the case in the cellular tissue beneath the other serous membranes ; consequently any accumulation of serum beneath them is always the sign of a morbid state. I have not unfrequently found some of the areolæ of the cellular tissue under the pleura filled with a gelatinous fluid. In some cases this was the only lesion present ; in others there was also thickening, induration, and a lardaceous appearance of the tissue.

3. In particular parts of the subserous cellular tissue there naturally exists a certain quantity of fat. When this is very abundant, it pushes the serous membrane before it, and projects into its cavity like a kind of fringe. It sometimes acquires an unusual hardness, and each of its vesicles assumes the form of a greyish semitransparent granule, of sufficient consistence to resist the pressure of the finger. When these vesicles are crowded together, they form considerable tumours of a granulated texture, like the tissue of the pancreas. I have found tumours of this description in the omentum ; here, again, we have another alteration that has been confounded under the general name of scirrhus or cancer.

4. The subserous cellular tissue is sometimes infiltrated with pus. Indeed it is much more frequently in the subarachnoid tissue, than in

the arachnoid itself, that the purulent matter is formed which is found extended in a layer of greater or less thickness over the hemispheres of the brain. In the other serous membranes, on the contrary, pus is much more frequently found in their interior than on their external surface. The formation of pus generally takes place where the subserous cellular tissue is most lax. Thus, the only part around the pleura where abscesses form, is the anterior mediastinum; and, in the abdomen, the ligamenta lata of the uterus are often the seat of purulent collections.

5. Other morbid secretions also have been found in the various portions of the subserous cellular tissue ; melanosis for instance : but the morbid production most frequently observed in this situation is tubercle, especially in the pleura and peritoneum. In the former it is often found in portions of the subpleural cellular tissue that are considerably thickened. In the peritoneum, an innumerable quantity of granular tubercles are frequently found studding the surface of the omentum and of the peritoneum which lines the abdominal parietes, as well as that which is reflected over the viscera. In the subserous cellular tissue of the intestines, tubercles are found in large quantities in those points which correspond to the intestinal ulcers.

CHAPTER II.

Lesions of the Fluid secreted by the Serous and Cellular Membranes.

Whether any of the various lesions described in the preceding chapter exist or not, the cavity of the serous membrane itself may contain various morbid productions, gaseous, fluid, or solid.

The gases found in the serous sacs are sometimes secreted by the membranes themselves; but they are much more frequently introduced from without. Thus, in almost all cases of pneumothorax, the gas contained in the pleura is atmospheric air, that has entered from the bronchia in consequence of the perforation of the walls of a tuberculous excavation situated near the surface of the lung.

The presence of gas in the cellular tissue is also frequently the result of a wound in the pulmonary parenchyma, through which the air insinuates itself into the whole extent of the subcutaneous cellular tissue. Occasionally, however, we observe instances of spontaneous emphysema, both partial and general; but such cases are rare, and the conditions under which they occur are as yet but little known.

The fluids or solids found in serous cavities are chiefly the following:

1. Serum : its composition is sometimes the same as that of the serum of the blood, and sometimes differs from it in containing either a greater or less proportion of albumen.

2. The same, combined with a certain quantity of the colouring matter of the blood.

3. Pure blood.   The peritoneum and pleura are particularly subject to these sanguineous effusions.

4. Pus : this secretion is often found in the cavity of a serous membrane, without its tissue presenting any perceptible lesion.

5. The spontaneously coagulable and organizable matter that produces the false membranes. For a description of these, see Vol. I.

I have also pointed out in the first volume the various conditions under which serum accumulates in the serous cavities, as well as in the cellular tissue.   I shall merely mention here a variety of serous infiltration, long known by the name of induration of the cellular tissue of new-born infants, (skin-bound).   This is merely the result of an accumulation of serum in their subcutaneous and intermuscular cellular tissue. Many of the children come into the world with this affection ; in others, it appears a very short time after birth.   Other parts of the cellular tissue are often infiltrated at the same time. Sometimes also there is œdema of the lungs.

This affection is often partial, being confined, for instance, to the hands, legs, or feet ; at other times, it is general, and it then either commences in one point and gradually involves the whole surface of the body, or appears all over it at the same time.

This induration of the cellular tissue of new-born infants is generally accompanied by a remarkable state of plethora, the principal internal veins being gorged with blood ; the skin is often remarkable for its complete want of colour; in other cases, on the contrary, it presents a redness proportioned to the general state of plethora ; and in some instances is of a bright yellow colour. Of seventy-seven children labouring under this affection, M. Billard found thirty affected with jaundice.

The child may die of this affection without any serious lesion being discoverable in any organ ; a considerable congestion in the various capillary networks being all that is observed. In general, however, we find some affection of the brain, lungs, or alimentary canal, which is to be considered as the principal cause of death.

This affection has been attributed to various organic lesions ; but, on the one hand, not one of them is constantly present, and, on the other, they may all exist without producing it. The

most constant alteration is a state of general hyperæmia of all the tissues ; but even this is not invariably present. The skin is at the same time very dry and tense, and appears to have lost the power of transpiring ; accordingly, in many cases we find the œdema disappearing rapidly after the employment of irritating frictions, and warm applications to the skin, which produce an abundant transpiration. It appears, then, that the suppression of the cutaneous perspiration is a principal agent in the production of this disease, and accordingly it occurs most frequently in cold seasons, and among the poorer classes, whose children are least provided against the inclemencies of the season.

We must be careful to distinguish induration of the cellular tissue arising from serous infiltration, from that arising from the subcutaneous fat becoming remarkably firm and as it were congealed. The latter usually takes place only during the last moments, or even after death, and its causes are quite unknown.

SECTION II.

DISEASES OF THE GLANDULAR ORGANS OF SECRETION.

As it is my intention in this work to treat only of the morbid anatomy of those organs the consideration of whose diseases belongs strictly to the department of medicine, I shall describe in this section only the diseases of the hepatic and urinary organs. As to the pancreas, I shall content myself with observing that it is exceedingly rare to find it altered. I have sometimes observed it redder than usual, and sometimes remarkably firm and compact. In some cases it is found compressed and reduced to a state of atrophy by scirrhous and tuberculous masses formed around or within it. I once saw the hepatic extremity of the pancreas transformed into a hard homogeneous mass of a greyish white colour, in which there was no trace of its natural organization perceptible. Another time I found it containing two small abscesses, each of which might have held a hazel nut. But, in general, we may assert that the pancreas is one of those organs in which alterations of structure are least common. It is, then, only by hypo-

thesis, that it has been made to play an impor-
tant part in certain gastric affections, where the
deranged digestion has been attributed to a de-
rangement of its secretion.

CHAPTER I.

Diseases of the Liver and its Appendages.

THESE are situated either in the substance of
the liver, or in its excretory ducts.

ARTICLE I.

DISEASES OF THE PARENCHYMA OF THE LIVER.

IF we carefully examine the structure of the
liver, we find that it is composed of two sub-
stances; one reddish, formed chiefly by the ra-
mifications of the capillary vessels of the organ;
and the other white or yellowish, which seems
chiefly destined for the secretion of the bile.

In the natural state, these two substances
are distinct; but yet a certain degree of atten-
tion is requisite to distinguish them. When
more blood than usual happens to stagnate in
the liver, the distinction between them is lost,

and the organ presents a uniform red colour. When, on the other hand, it contains less blood than usual, the yellow substance becomes more apparent, and in some cases the deficiency of blood is so great, that the red substance loses its colour, and the whole of the liver presents a whitish tinge.

These various shades of colour may be owing, 1. to a mechanical obstruction to the venous circulation ; in this case, the liver is uniformly red ; 2. to the diminution of the total mass of the blood ; here the liver appears more or less completely deprived of colour ; 3. to certain affections of the organ itself, which affect its circulation, and produce in it a state of hyperæmia or anæmia.

The appearance of the liver may also undergo considerable alterations from changes of texture occurring in either of its component parts. Thus, the white substance may be affected with hypertrophy ; of which there are two degrees. In the first, the substance of the organ is traversed by lines or circumvolutions of a yellowish white colour, which are much more distinct than in the natural condition. In the second, both its interior and exterior are studded with numerous granules, either isolated or agglomerated, and remarkable for their colour resembling that of yellow wax. These whitish granules I consider to be merely the white substance

in a state of hypertrophy.   Dr. Bouillaud * has clearly proved that an unusual developement of the acini of the liver is all that is requisite to give it a granulated appearance.   In this case, therefore, as in the case of the pulmonary granules, there is no necessity for supposing the production of any new tissue ; a simple modification in the structure of one of the component parts of the organ being sufficient to account for them.

These yellow granules have not always been viewed in this light.   Laennec considered them as an accidental tissue created in the liver, and termed it *cirrhosis* from its colour.

While the white substance of the liver is thus preternaturally developed, the red may continue in its natural condition, or may be altered in its colour, which often becomes very pale or olive green ; and in its bulk, which may be either increased or diminished.   Laennec remarks that *cirrhosis* is often accompanied by a shrivelled state of the liver.   The red substance, as it wastes away, becomes infinitely less vascular, and, in certain cases, is in a great measure transformed into cellular or cellulo-fibrous tissue.   This state of the liver is almost constantly accompanied by ascites.

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* *Memoirs de la Societé Medicale d'Emulation,* vol. IX.

The red substance is likewise susceptible of a very remarkable kind of hypertrophy, which produces in the interior of the liver small, hard, red masses, that are distinguished from the surrounding parenchyma by their greater consistence, and deeper colour. These may be unequal in form and size, or else distributed through the liver so as to divide it into a number of similar lobules.

Having thus briefly described the alterations which each of the two component parts of the liver individually presents, let us now turn our attention to the alterations of the entire mass of the organ, which we shall find, as usual, to comprise lesions of circulation, nutrition, and secretion.

§ I. *Lesions of Circulation of the Liver.*

Hyperæmia is one of the morbid states most frequently presented by the liver. It is sometimes general, and the organ is then of a uniform red throughout: its volume is increased, and its consistence but little altered, when the affection is simple. In many cases, the hyperæmia is only partial, forming in different parts of the organ red spots of various forms and sizes, surrounded by a paler parenchyma.

Hyperæmia of the liver is of three kinds.

The first results from a process of irritation. This irritation is sometimes idiopatic, and sometimes subsequent to a similar affection of the alimentary canal.

In the second kind, the blood accumulates in a manner wholly passive in the parenchyma of the organ, just as it does in the gums of of scorbutic patients.

The third kind is purely mechanical, being observed where there is any obstacle to the free entrance of the blood into the right side of the heart ; the blood then stagnates in the supra-hepatic veins, and *obstructs* the liver.

Congestion of the liver from a mechanical cause is frequently produced in infants while coming into the world ; and such of them as die in a state of asphyxia have that organ so gorged with blood, that it sometimes ruptures its vessels and is effused in a layer on its convex surface beneath its investing membranes.   M. Billard has repeatedly seen an effusion of blood into the abdomen produced by this turgid state of the liver.

Instead of accumulating in the hepatic capillaries, the blood may escape from its vessels, and become effused into the parenchyma of the organ, thus producing a kind of hepatic apoplexy.   Some of these hæmorrhages are owing to the rupture of one of the principal vessels

distributed to the liver.*   In other cases, how-
ever, there is no perceptible rupture of any ves-
sel, all that is observed being a collection of
fluid or coagulated blood in one or more points
of the liver.   This was well exemplified in a
liver shewn me by M. Rullier, which, besides
various collections of fluid and semicoagulated
blood, contained also some of a firmer consist-
ence, in the centre of which were contained
several hard fragments of fibrine deprived of
their colouring matter.   The examination of
this liver led me to inquire whether fibrine thus
deprived of its colour might not be the origin of
certain accidental productions, such as encepha-
loid and others, that are often found in the liver;
and my conjecture received additional confir-
mation from the examination of another liver
shown me shortly after by M. Reynaud, in
which I was able to trace the various changes
of the blood from the perfectly fluid state until
it passed into a substance possessing all the cha-
racters of encephaloid.

§ II. *Lesions of Nutrition of the Liver.*

Of these lesions, some, such as hypertrophy
and atrophy, produce a change in the size of the

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* Vide *Clinique Medicale.*

organ ; while others, such as softening and in-
duration, only affect its consistence. We must
take care not to confound increase of size arising
from hypertrophy, with that arising from simple
hyperæmia.

Hypertrophy of the liver may be divided into
several kinds, on account of the different varie-
ties of colour, consistence, and form, it presents.
Thus, with respect to colour, the tissue of the
liver may be extremely pale, of a much deeper
red than usual, or of various other tints, such as
grey, deep green, or brown, which last in some
places merges into black. As for its consistence,
it may either remain in the natural state, or be
increased or diminished. Lastly, with respect
to form, the hypertrophy may affect all the parts
of the organ equally, and thus produce no change
in that particular ; or, by chiefly affecting one of
its substances, or being accompanied by atrophy
of the other, may give it a lobulated, mammil-
lated, or granular appearance.

Hypertrophy of the liver may take place in
the three lobes at the same time, or be confined
to one of them. Sometimes the right lobe is
the one affected, and it then constitutes of itself
almost the whole organ, the left appearing
merely like a small appendage attached to it.
Sometimes, on the contrary, it is the left lobe
that is particularly enlarged, and the liver then

projects considerably into the left hypochondrium, and might sometimes, when felt through the abdominal parietes, be taken for the spleen ; in other cases the projection is observed only in the epigastrium, where it might be mistaken for a tumour of the stomach. As to the *lobulus Spigelii*, I cannot confirm from my own observation what has been asserted of the frequency of its enlargement without the other lobes being affected.

The liver of the fœtus, and of very young children, is naturally in a state of hypertrophy, as compared with that of the adult. But, as the new-born infant advances in age, the liver gradually diminishes in size, ceases to extend into the abdomen, and retires behind the ribs, below which it does not again extend except when diseased. However, in some cases, this kind of natural atrophy does not take place, and the organ retains during childhood, or even during life, the excess of bulk it had at the period of birth : this state of the liver is generally connected with other perversions of nutrition which together form that particular state termed the *scrofulous diathesis*. Here, then, the hypertrophy of the liver is produced by a cause which acts at the same time on many other parts, and is in fact one of the local signs of an affection really universal.

Atrophy of the liver, considered as affecting its substance generally, may extend to the three lobes, or be confined to one, and may be accompanied by induration or by softening.

The liver, when in a state of atrophy, is generally diminished in size ; this, however, is not necessarily the case, as it is sometimes as large as, or even larger than in the natural state ; but then, in proportion as its proper tissue has disappeared, it has been replaced by cellular tissue. In such cases the organ having lost its peculiar structure and organization, is reduced to its primitive frame-work, and large patches are found in it occupied only by cellular tissue, which sometimes becomes hypertrophied, and in some cases contains serous cysts or hydatids, which, far from announcing an augmentation of the organic action of the part where they appear, are perhaps connected with its diminution ; the cellular tissue, though unable to produce the hepatic parenchyma, showing its tendency to organization by becoming a serous cyst.

Induration of the liver has long attracted the attention of medical men. It is frequently accompanied by hypertrophy or atrophy of the parenchyma ; but it may also exist without either. The liver, when indurated, may be of a lighter or deeper red, or of a grey, green, or brown colour.

Softening of the liver is, at least, as frequent as its induration. There are two degrees of it. In the first, the diminution of consistence of the parenchyma is not perceived until it is pressed between the fingers, when we find that it readily gives way, and is reduced to a pultaceous mass. In the second, which is much more uncommon, the softening is evident to the eye, the tissue of the organ presenting an appearance similar to that given it by prolonged maceration: the vascular apparatus is, in a manner, dissected from the cellular frame-work, and its ultimate branches, deprived of their uniting medium, float in a red or grey pulp, which seems to be merely the hepatic parenchyma reduced to the fluid state.

The softened liver sometimes retains its ordinary colour; in some cases, it is in a state of hyperæmia, and consequently red or brown; and in others, it is remarkably pale, which seems to result from its tissue being modified in such a manner as no longer to admit the colouring matter of the blood, of which there are no traces to be found except in the large vessels.*

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* Vid. *Clinique Médicale*, (Maladies de l'Abdomen).

§ III. *Lesions of Secretion of the Liver.*

The experiments of M. Braconnot have proved that the liver naturally contains a small quantity of fatty matter; it also secretes another fatty principle that is met with in other parts of the body likewise, and is known by the name of *cholesterine.* Now, if these happen to be secreted in more considerable quantities than usual, or to be modified in their qualities, they give rise to certain morbid appearances in the organ.

M. Vauquelin has ascertained that there exists in fatty livers an oily principle, to which they owe their peculiar appearance, and their property of greasing the scalpel. It is easily extracted from them by boiling, and amounts sometimes only to a few drops, and sometimes to such a large quantity as to take up more room than the hepatic parenchyma itself. The parts of the liver infiltrated with this oily principle are remarkable for their pale yellow colour, like that of decayed leaves, and their consistence is diminished; they do not seem to contain any blood, or at least there is no trace of its colouring matter to be found. The secretion sometimes occupies the whole extent of the organ, and sometimes exists only in some scattered points. Instead of

being infiltrated through the parenchyma, it is occasionally collected in some one spot, being deposited there like tubercle or pus, and forming grey or white morbid masses, which thrust back the substance of the liver, and present to the eye and the touch all the properties of fat. Masses like these have been found wholly formed of cholesterine. The causes that give rise to this fatty secretion in the liver are as yet unknown, it being a mere hypothesis to attribute it to irritation.

I have already had occasion to remark that almost all the cases of fatty degeneration of the liver are observed in consumptive patients, that is to say, in persons whose blood is no longer suitably elaborated, and in whom the pulmonary exhalation cannot be accomplished as in the natural state. Now may we suppose, that, because in such persons a sufficient quantity of hydrogen ceases to be expelled by the bronchial mucous membrane in the form of aqueous vapour, that principle is separated in excess from the mass of the blood in the hepatic parenchyma, and so produces the fatty matter there? I offer this merely as an hypothesis; but still I think it deserves consideration, as likewise does the question how far pulmonary melanosis arises from a similar defect of elimination of the carbon by the same membrane; and, how far the

greater frequency of the gravel in cold or damp situations or seasons depends upon less azote than usual being removed from the blood through the lungs under such circumstances.

Several morbid productions, that have nothing analogous to them in the healthy state, may be developed in the liver. Amongst these is pus, which may be found either infiltrated through, or forming a collection in it.

Abscesses of the liver are so rare that some modern authors well acquainted with morbid anatomy have questioned the reality of their existence. In fact, they are exceedingly rare in these countries, but are common enough in hot climates, as may be seen by perusing the works on the diseases of Europeans in India.*

The pus contained in the liver does not differ from that of other parts of the body, neither has it the colour of lees of wine, as has been asserted. In every instance in which, I found pus in the liver, it was of the same colour and consistence as that of a phlegmonous abscess.

Of the purulent collections seated in the liver, some are so small as to consist of a single drop, while others, again, occupy an entire lobe, and sometimes even almost the whole of

* Vid. Annesly *On the Diseases of India*.

the organ. Occasionally, there are several of these collections, which sometimes communicate by fistulous passages, and sometimes remain perfectly isolated. The walls of these abscesses are often formed of the tissue of the liver itself; in other cases, they are lined by a cellular or pseudo-mucous false membrane.*

The pus thus accumulated in the liver endeavours to escape from it by different ways; the following are those that have been enumerated as capable of forming outlets for it.

1. A fistulous passage opened through the skin of the abdomen, ribs, or axilla.

2. A perforation of the diaphragm and pleura, into the cavity of which latter the abscess bursts.

3. A perforation of the diaphragm, pleura, and pulmonary parenchyma, so that the pus is evacuated through the bronchia. It is necessary for this, that adhesions should have been previously established between the liver and the diaphragm, and between the diaphragm and the lungs.

4. The abscess may burst into the cavity of the peritoneum.

5. It may burst into some part of the ali-

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*Louis, *Mémoire sur les abcès du foie, dans le Répertoire d'Anatomie,* etc. *Clinique Médicale* (Maladies de l'abdomen.)

mentary canal, either the stomach, duodenum, or colon. It has been asserted that a perfect cure may result from this mode of evacuation.

6. When near the gall bladder, it may empty itself into it, and pass from thence into the biliary duct.

7. A case is recorded of the communication of an abscess of the liver with the interior of the vena cava.

8. Another is mentioned of its opening into the pericardium.*

The cases in which pus has been found in the liver may be referred to four classes. The first comprises those in which abscesses have been formed in consequence of a spontaneous irritatation of the organ, whether primary, or subsequent to a gastro-intestinal irritation. I have already said that such cases are very rare, at least in this climate. To the second, may be referred those cases in which the irritation of the liver, instead of arising from any internal cause, has been the result of some external violence that has acted directly on the hepatic region. The third comprises those in which the abscess has been produced by an irritation arising from some external cause that has acted, not on the liver itself, but on the brain. How-

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* Vid. *La Clinique des Hôpiteaux,* vol. i. No. 71.

ever, the question of the formation of abscesses of the liver succeeding to wounds of the head requires some farther investigation. Lastly, to the fourth class belong those cases in which the pus seems to have been carried into the liver in the blood by a genuine metastasis. In these cases, at the same time that we find one or more purulent collections in the hepatic parenchyma, without any appreciable alteration of the surrounding tissue, we meet with similar collections in other parenchymatous organs. This may occur in three different cases : 1. where there exists a collection of pus in some other part of the body ; 2. immediately after such a collection has been dried up ; and, 3. after the establishment of a suppuration in some part of the body by a surgical operation. In these three cases, we may account for the phenomenon, either by admitting a metastasis of the morbid product ; or by supposing that, from the circumstance of pus being no longer formed in a part of the system where it had long been secreted, the system, being accustomed to the secretion, set it up in an other part ; or by supposing that there are certain individuals in whom suppuration cannot be established in any one point of their body, without having a tendency to become established in other points also.

Writers have described by the name of can-

cer of the liver, an alteration of that organ in which certain morbid productions distinguished by well marked physical characters are deposited in its parenchyma. They are those that have been described in the first volume by the names of *encephaloid* and *colloïd* matter. They produce in the liver masses of various sizes, that are sometimes uniformly white, and sometimes white mixed with red. Their consistence is not always the same, some of them being firmer than the surrounding parenchyma, and others resembling a greyish pap, in the midst of which a greater or less quantity of blood is often effused. These masses frequently occupy the greatest part of the organ, leaving scarcely a vestige of its natural tissue between them. They occasionally project on its external surface ; and the liver then has a knobbed appearance which is sometimes perceptible through the abdominal parietes.

It follows from some facts already mentioned, that these so called cancerous masses may arise from an effusion of blood, which, when coagulated within the substance of the liver, undergoes the various changes I have described. But, it is far from being proved that such is always the origin of these cancerous tumours. In many cases, all that we can discover, is at first the infiltration of a minute portion of the pa-

renchyma of the organ with a whitish matter, the parenchyma being at the same time more or less injected at the point of infiltration or around it. This whitish matter gradually becomes more abundant, and the proper tissue of the organ no longer displays such an appearance of vascularity, though its vessels may still be detected by dissection or maceration ; and it is then often discovered that the vessels traversing the morbid mass, which at first appeared to be vessels of new formation, belong to the liver itself. The surrounding parenchyma generally falls into a state of atrophy, but it may also become irritated and inflamed, in which case it often secretes pus, or ulcerates, and in this way produces a communication between the mass of encephaloid and the cavity of the peritoneum or of the intestine.

A white friable substance, which is considered to be tubercle, is sometimes, though rarely, found in the liver ; it occurs either by itself, or mixed with encephaloid matter, from which it may be distinguished by its different colour and consistence. Melanosis is a secretion of still more rare occurrence in this organ.

Lastly, hydatids are frequently found in the liver, contained in cysts, which are sometimes so enormous as to occupy almost the whole of the organ. The walls of the cyst are generally

composed of fibrous membrane, which may be detached from the tissue of the liver without tearing it.   The cyst is often very near the external surface of the liver, and may even project above it, and thus become sensible to the touch through the abdominal parietes.*

These cysts may open, 1. externally, through the abdominal parietes ; 2. into the cavity of the peritoneum ; 3. into the interior of the alimentary canal ; 4. into the pleura ; 5. into the bronchia, whence they are expelled by expectoration.

ARTICLE II.

DISEASES OF THE BILIARY DUCTS.

The biliary ducts and gall bladder are liable to various alterations, none of which give rise to any unpleasant symptoms during life, unless they produce a diminution of their caliber.

The lining mucous membrane of the biliary ducts is sometimes so swollen, from the effects of hyperæmia, as to contract, or even totally obstruct the passage of the part affected.   I have seen cases where jaundice arose from this cause.   The source of the hyperæmia may

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* *Clinique Médicale.*

either be in the ducts themselves, or in the alimentary canal, the irritation spreading from thence along the ductus choledochus.

When the obstruction exists in the ductus choledochus, it often happens that the other ducts and the gall bladder become dilated; this may be carried to such a degree as to produce in the liver accidental cavities filled with bile.

When affected with chronic irritation, the walls of the biliary ducts may undergo a considerable degree of hypertrophy, their cavity at the same time remaining unaltered, or becoming enlarged. In some cases, however, the cavity is completely obliterated, and the duct transformed into a fibrous cord. This alteration has been observed both in the ductus choledochus and cysticus.

When the ducts have been obliterated for a certain length of time, the gall bladder, which was at first dilated, contracts, the bile is absorbed out of it, and its diminished cavity contains only a little mucous matter, or else is completely filled with calculi.

Under the influence of acute or chronic irritation, the walls of the biliary ducts sometimes become softened or ulcerated, and eventually perforated; in consequence of which the bile escapes into the cavity of the peritoneum. The

perforation occasionally takes place in some point behind where the duct is obstructed.

The gall bladder presents the same alterations as the ducts, its walls being found red, ulcerated, softened, or perforated. In this last case, the bile sometimes escapes into the peritoneum, and sometimes is evacuated through a perforation in the integuments.

In other cases the walls of the gall bladder are found in a remarkable state of hypertrophy, the folds of the mucous membrane disappear, and a dense cellular substance, like fibrous tissue, is interposed between the mucous and the serous membranes ; I think I have sometimes perceived some muscular fibres in this situation.

While the walls of the gall bladder are thus hypertrophied, it may itself become considerably enlarged. It may, however, become greatly enlarged, so as to extend beyond the thin margin of the liver, without its walls appearing at all thickened ; being merely distended by the accumulation of bile, in consequence of some obstruction in the ductus choledochus.

There are two degrees of atrophy of the gall bladder : in the first, there is still some little cavity left ; in the second, it is completely obliterated, and the ductus cysticus terminates in a mass of cellular tissue.

Atrophy of the gall bladder often occurs without any known cause. It is sometimes the result of some obstacle to the entrance of the bile into the ductus cysticus ; as the reservoir, then becoming useless, it has a tendency to disappear, like the thymus, suprarenal capsules, &c., under similar circumstances. In other cases, it occurs in consequence of inflammation. The reader will find in my *Clinique Médicale* a remarkable case of a person who, some time before his death, passed pus and calculi through a fistulous opening that formed spontaneously in the right hypochondrium, and in whose body there was no vestige of a gall bladder discovered on examination after death.

The gall bladder sometimes becomes the seat of various morbid secretions, which occur either in its interior, where we find mucus, calculi, blood, pus, &c., or in the substance of its walls, which are not unfrequently infiltrated with serum, or contain tuberculous or calcareous matter ; they have sometimes been found almost wholly ossified.

The gall bladder presents some congenital malformations. Thus, it is sometimes completely wanting, and the liver then resembles that of certain animals. In other cases, it is divided into several compartments. In others, again, it receives its duct directly from the liver,

and gives off another which opens directly into
the intestine.   There are also some remarkable
varieties of conformation in the various biliary
ducts ; such as two ductus choledochi, either
both opening into the duodenum, or one there,
and the other into the stomach ; or the ductus
choledochus opening into the stomach, a malfor-
mation which, if we are to believe the account
of an old author, was in one instance accompa-
nied by an habitual bulimia.

ARTICLE III.

ALTERATIONS OF THE BILE.

WE cannot establish any connexion between
the alterations of the liver (such, at least, as we
can discover by anatomy) and those of the bile.
In the greater number of the lesions of the liver
just described, the bile in the ducts and gall-
bladder does not appear altered either in quan-
tity or quality.   In other cases, again, where
the structure of the liver does not appear at all
changed, the bile is either excessive or deficient
in quantity, or altered in its sensible qualities.
I have sometimes been astonished at the im-
mense quantity of this fluid in the intestines,
in cases where they were but slightly inflamed,
and the liver did not appear in the least altered.

The reason of the secreting fluid's being altered without the secreting organ's being so, is, that in the liver, as in every other organ destined to separate a fluid from the blood, the alterations of texture that are apparently the most serious, are not always those that exert the greatest influence over the act of secretion; the derangement of this secretion seems to depend rather on certain lesions of the organ that escape our observation, and not unfrequently on the lesions of other parts. Thus, Magendie's experiments have proved that, by changing the food of an animal, we can alter at pleasure the composition of the bile, which is evidently owing to the previous alteration of the blood from the same cause.

Alterations in the quality of the bile may be discovered, 1. by simple inspection; 2. by physiological experiments; and, 3. by chemical analysis.

We have long been aware, from experiments on animals, that the bile taken from some dead bodies, produces no other inconvenience when introduced into the living body than an inconsiderable irritation, while that taken from others produces much more serious consequences, and sometimes even death itself. In some instances, it may be touched and tasted with perfect safety; in others, it produces pustules, ulcers, &c.,

on the tongue and lips. Here, then, we have very important changes in the bile, which we never could have learned from anatomy.

The only alterations in the quality of the bile discoverable by inspection are changes in its colour and consistence. It has been observed to have every shade of colour from the deepest black to an almost transparent whitish tint. Its consistence is also very variable, it being sometimes as thick as pitch, sometimes like glue, and sometimes fluid as water.

We learn from chemical analysis that the different component elements of the bile vary greatly in their proportions. Sometimes, especially in cases of fatty liver, it is found to contain scarcely any thing but water and albumen. At other times, the yellow matter, the resin, or the cholesterine is the predominant principle. The causes on which these variations depend are as yet unknown.

It is this change in the proportions of the component parts of the bile that produces biliary calculi. These calculi are found in three different parts: 1. in the interior of the liver, where they are lodged in the ramifications of the excretory ducts; 2. in the three great ducts (hepaticus, cysticus, and choledochus); 3. in the gallbladder. This last may contain numbers of calculi, without giving rise to any appreciable

symptom´; while, on the other hand, a single calculus lodged in the ductus hepaticus or choledochus may produce jaundice by presenting an obstacle to the escape of the bile.

The size of these biliary calculi is very variable, some being like grains of sand, and others as large as a walnut or a small hen egg. Their number is generally in inverse proportion to their size. Whenever there are many of them together in the gall-bladder, they are observed to have facets on them. They are sometimes rugged, like the urinary calculi composed of oxalate of lime. Their principal colours are white, yellow, and black. It is very common to find calculi that are black externally, and yellow internally. Some of them have a brilliant and semitransparent fracture.

With respect to their chemical composition, there are five varieties of biliary calculi ; the first consisting of the yellow matter of the bile ; the second, of the resinous matter ; the third, of cholesterine ; the fourth, of picromel ; and the fifth, of phosphate of lime. I have twice found the last mentioned variety in the gall-bladder ; but in both instances the obliteration of the ductus cysticus had long prevented the entrance of any bile into it, and the calculus had formed in the mucus it contained.

Instead of bile or matters formed at the ex-

pence of that fluid, there are sometimes found in its excretory ducts, 1. mucus and pus, as has been already mentioned ; 2. blood ; 3. entozoa ; these are either individuals of the species *ascaris lumbricoides,* which get there from the intestines, or of the *fasciola hepatica,* which are formed in the ducts themselves.

It was supposed that the jaundice always arose from some obstacle in the biliary ducts to the passage of the bile into the duodenum, but this opinion is incorrect, inasmuch as those ducts are often found perfectly free in persons that die of the disease.   Indeed nothing can be more variable than the state of the liver in jaundice ; any one of the numerous alterations to which that organ is subject, may be attended by it, but none of them are constantly or inseparably connected with it.   There are even cases of icterus where we cannot discover any lesion whatever in the liver or its appendages ; and in many such cases we have reason to doubt that the liver had any thing to do with the disease. We are not to suppose, however, that the yellow tinge of the skin can be produced only by the presence of the colouring matter of the bile in the blood, as it sometimes seems to arise merely from a sanguineous suffusion of its tissue. Such, especially, seems to be the nature of the *icterus neonatorum,* in which we can observe the

red tinge of the skin gradually changing into a yellow, which in its turn fades away, and is succeeded by the natural colour of the part. Neither can we find in the liver of children that die of this disease any constant lesion that could account for it. Some have asserted, indeed, that in such cases they found the liver gorged with blood ; but it is found at least as frequently in the same state where there has been no jaundice at all.

CHAPTER II.

Diseases of the Urinary Apparatus.

IF we consider the great activity with which this apparatus performs its functions, and the constancy of its action, we shall find reason to conclude that it ought to be very frequently deranged. This opinion will be strengthened by observing the wonderful rapidity with which every circumstance that is capable of affecting the system affects the secretion of urine. There is scarcely a disease which does not produce some change in it ; and the nature of the food used, the least variation in the atmosphere, or even a mere emotion of the mind, are any of them sufficient to alter its composition, or in-

fluence its excretion.   Yet, notwithstanding all
these disturbing causes, the organization of the
urinary apparatus is not very frequently altered.
In the greater number of diseases, whether acute
or chronic, we cannot discover by dissection any
change in the structure of the kidneys ; and the
rest of the apparatus is in general equally free
from lesion ; so that we have here another case
where the functional derangements of an organ
are not elucidated by its structural alterations.

ARTICLE I.

DISEASES OF THE KIDNEYS.

§ I. *Lesions of Circulation.*

THE kidneys are sometimes found in a state
of hyperæmia, and so gorged with blood that it
gushes forth when an incision is made into them.
This state of congestion may extend to both
kineys, or may be confined to one.   It may be
either general, or partial, or, in other words, may
affect both the constituent parts, (the tubular
and the cortical,) of which the kidney is com-
posed, or only one of them.   In the former case,
these two substances become confounded toge-
ther, and cease to be so distinct from each other

as before. When the kidneys are affected with hyperæmia in a very high degree, they assume a kind of chocolate colour. I once found them in a considerable state of hyperæmia, without any other alteration, in an individual that had died of diabetes.

Incomplete anæmia is the state in which the kidneys are usually observed to be in persons that have sunk under chronic diseases. When carried to a high degree, the anæmia becomes of itself a disease, but it has not as yet been discovered to produce any peculiar derangement of function during life : it is not uncommon in dropsical patients, in whom the kidney is often remarkable for its extreme paleness, and scarcely contains a drop of blood. The whole of the organ may be thus affected with anæmia ; or it may be confined to the cortical substance; or even to the tubular. Lastly, there are some cases in which we find the affection existing only in a few scattered points, whose perfect paleness contrasts strongly with the redness of the rest of the organ. There are often three or four such points in the same kidney, and they are generally situated in the cortical substance near the surface. In such cases, when we attempt to inject the vessels of the kidney,* we sometimes

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* Reports of Medical Cases, &c., by Richard Bright, London, 1827, in 4to.

find that the injection penetrates the organ as usual, except in the colourless spots, where it stops as if the vessels there were obliterated.

We also find occasionally in the kidneys a deep yellow colour, either uniform or spotted with red or white. I am inclined to think that this is owing merely to a less advanced degree of anæmia.

The kidneys, when in a state of anæmia, are in some cases soft and flaccid, and in others unusually firm and indurated, so as to give the idea of being converted into cartilage.

It has been often asserted that the chief alteration observed in the kidneys of persons that die of diabetes, is an extreme paleness of their tissue. However, I have just mentioned a case in which they were, on the contrary, in a state of hyperæmia. In another case that fell under my observation, they retained their natural appearance. We shall see farther on some cases in which the disease was accompanied by hypertrophy of the kidneys. As far as I am aware, there has not been a single instance recorded, within the last ten years, of the kidneys of a diabetic person being in that state of anæmia that has been so insisted upon by some authors.

§ II. *Lesions of Nutrition.*

The kidneys are occasionally found much larger than usual, without any other change of structure. This simple hypertrophy may affect but one of them ; and it generally happens that when one is wanting, or much smaller than usual, the other becomes preternaturally enlarged. I saw a case where hypertrophy of one of the kidneys seemed to depend on the circumstance of there being two renal arteries at that side. M. Lauth, of Strasburg, has recorded a similar instance, in which the enlarged kidney, besides its ordinary nerves from the semilunar ganglion and lesser splanchnic, received also several twigs from the second lumbar ganglion. Hypertrophy of the kidneys is one of the most common lesions observed in cases of diabetes.

I think we ought to refer to an exuberance of nutrition, those cases of malformation in which the kidneys are united by an intermediate substance resembling them in its texture, and passing from one to the other over the vertebral column. This kind of middle lobe presents several varieties of arrangement, being sometimes without any special vessels, and sometimes receiving them directly from the aorta and vena cava, in which case it sends off a duct re-

sembling a ureter, which either runs into the natural ureters, as is generally the case, or opens directly into the bladder.

We find in several authors a description of granulations existing in the cortical substance of the kidney, which are by some considered as serving to secrete the urine, and by others as consisting of a mass of vessels interlaced. Be that as it may, similar granulations are sometimes observed to constitute a really morbid state. Granulations of the same description are, as I have already stated, not unfrequently found in the liver. In the latter organ, they evidently result from hypertrophy of one of its anatomical elements; but, in the kidneys this is by no means so certain, their nature being as yet not well understood. Dr. Bright, who has given an excellent description of them, represents them as existing only in the cortical substance; I have, however, seen one case in which the tubular substance also contained them. They are small, hard, whitish bodies, of various sizes, and of a globular form. Sometimes they are few in number, and sometimes they are crowded together so as scarcely to leave any traces of the cortical substance, and even to occupy the intervals between the cones of the tubular substance. In some instances they project beyond the surface of the organ, so as to be distinguishable

through its fibrous tunic ; in others, they occu-
py only its interior.

In the various cases of this affection observ-
ed by Dr. Bright, the urine contained albumen,
and the patient was dropsical, although the
heart and liver were sound. I have mentioned a
similar case in the third volume of my *Clinique
Médicale*, which appeared about a year before
the publication of Dr. Bright's work. It is
difficult to comprehend how this state of the
kidneys should produce dropsy, but the fact is
certain.

The kidneys are also subject to atrophy,
which may be either general or partial. Gene-
ral atrophy of the kidneys is characterized
merely by the diminution of its volume, and
may affect one or both. In an individual who
died at *La Charité* without having ever shown
any symptoms of lesion of the urinary passages,
I found the kidneys exceedingly unequal in size,
one of them being of the ordinary dimensions,
while the other was scarcely as large as that of
a new-born infant. Its structure was natural,
but its vessels were much smaller than usual.

I have seen some cases where the general
atrophy of the kidney depended on the exist-
ence of a tumour in its neighbourhood, or of an
abscess formed around it. An instance of this
kind is recorded in my *Clinique Médicale :* the

tumour, which was very large, and contained hydatids, was situated between the liver and the kidney, which was completely hidden by it. In such cases, it is evident that the atrophy of the kidney is accidental, depending either upon the mechanical compression, or upon the diminution of activity in the nutritive process in the kidney, in consequence of its increase or derangement in the surrounding parts. In other cases, as in the one mentioned in the preceding paragraph, it is impossible to decide whether the atrophy was congenital or accidental.

Lastly, one of the kidneys may be completely wanting. I have seen two cases of this description. The subject of one of these was a woman of sixty, in whom there was not a vestige of the left kidney to be found, and the left renal artery was also totally deficient. However, the left suprarenal capsule was well developed; which shews that its existence does not necessarily depend upon that of the kidney.

The subject of the second case was a young man who entered the hospital in a state of dropsy, of which the organic cause could not be detected. He was carried off by a phlegmonous erysipelas of the right femur, which terminated in gangrene. The peritoneum was found to contain a quantity of limpid serum; there was also some in the pleura and pericardium; and

the whole of the subcutaneous cellular tissue, and a great portion of the submucous, were infiltrated with the same fluid. The lungs, heart, large vessels, thoracic duct, liver, and spleen, were all sound. The urinary apparatus, on the contrary, was remarkably disordered, the right kidney being enlarged, softened, and studded with those whitish granulations already described; and the left being totally wanting. Instead of the left renal artery, there was an exceedingly small vessel, which was lost in the cellular tissue that occupied the place of the kidney. On the internal surface of the bladder, at the point where the left ureter usually enters it, was a very small orifice, leading into a duct which immediately terminated in a *cul-de-sac*. I did not take any note of the state of the suprarenal capsule.

I have given these cases in detail, because I conceive that all the facts mentioned are worthy of notice. We must not omit to observe, too, that dropsy was present only in the second case, where the kidney that remained was diseased.

There is yet another case, of more common occurrence than the preceding, in which the single kidney is found, not in its natural situation, but in front of the vertebral column. In every case of this description which I had an opportunity of examining, the kidney was only

apparently single, being composed of the two united and confounded together in the median line, like the eyes in cases of *cyclopia*.

I know of but one instance of complete absence of both kindneys in the adult, which is that recorded by Klein. It is, however, by no means perfectly decisive, as, in my opinion, it seems to be rather a case where those organs were in a rudimentary state. He says he once found the two ureters terminating at their superior extremity in three or four small *culs-de-sac*, which had no renal parenchyma around them. It would have been interesting to learn, whether there was any urine secreted in this case.

Even in monstrous fœtuses, the kidneys are almost always present, though other organs, such as the heart or liver, may be wanting. However, Fleishman has recorded a case of complete absence of the urinary apparatus in a seven months' fœtus, which had neither an anus, genital organs, nor inferior extremities, while the heart, liver, and alimentary canal, as far as the anus, were natural.

It sometimes happens that there appears at first to be but one kidney, from the circumstance of the other being situated in the hypogastrium, beside the bladder. I have seen a case of this kind : the renal artery was furnished, not by

the aorta, but by the hypogastric artery; and the ureter, which was very short, entered the bladder at the usual situation. The most remarkable fact in this case is the origin of the renal artery, which proves that the point of the circulating system from which an artery is given off, has little to do with the developement and accomplishment of the functions of the organ to which it is distributed. As to the question whether the unusual origin of the artery caused the unusual situation of the kidney, or the reverse was the case, we shall, probably, never be able satisfactorily to decide it.

We now come to the case where the atrophy of the kidney is only partial, being confined to one of its substances. As far as I am aware, the cones of the tubular substance are never affected with atrophy except in such cases as that mentioned by Klein; while the cortical substance, on the contrary, is not unfrequently found in a state of atrophy. In such cases, the bases of the tubular cones rest on the fibrous tunic of the kidney, or at most are separated from it only by a very delicate layer of cortical substance; there are also evident depressions between the cones, arising from the loss of the cortical substance.

The kidneys are likewise subject to softening and induration. The former is often ac-

companied by hyperæmia ; their co-existence may be considered as conclusive evidence of inflammation ; and this conclusion drawn from dissection may be confirmed by the symptoms observed during life. Thus, I have sometimes found the kidneys intensely red, and almost pulpy, in the bodies of persons who, some time before death, had felt pain in the lumbar region, and had passed bloody or purulent urine. I met this same red softening in the highest degree in a man whose kidneys contained large calculi. I have also found it accompanying various chronic alterations of the bladder, such as thickening and brown coloration of its mucous membrane, puriform secretion of its follicles, &c.

There is another kind of softening, in which the substance of the kidney is remarkably pale, or of a peculiar grey tint. I have observed this in cases where there had not been the least symptom of disease of the urinary passages. Its nature and causes are as yet unknown.

Induration of the kidney, like its softening, is of two kinds; one attended with hyperæmia, and the other with blanching of the tissue. The first kind is generally accompanied by a state of hypertrophy of the organ; the second may likewise be accompanied by enlargement of the kidney, but, in most cases, its bulk is di-

minished. The white induration of the kidney presents two degrees: in the first, it is firmer than ordinary, but retains its natural structure; in the second, which seems a more advanced stage of the first, its tissue is so condensed, hard, and white, as to resemble cartilage. I have sometimes found this second degree of induration confined to two or three of the tubular cones.

§ III. *Lesions of Secretion.*

Under this title I comprise the various productions that seem to be deposited in the parenchyma of the kidney, by a process resembling that which produces the perspiratory exhalation in every living particle. The alterations of the urine, therefore, do not belong to this class. The morbid productions at present under consideration are as follows.

1. *Serum.* We not unfrequently find in the cortical substance small cysts with serous parietes, which adhere but slightly to the tissue of the kidney, and contain a limpid colourless fluid. These cysts sometimes become enormously developed, and the parenchyma of the organ wastes away proportionably, so much so, that we occasionally find the whole interior of the kidney occupied by a large serous sac, the cavity of which is generally divided into several

compartments. This transformation seems to be produced rather by a diminution of the natural activity of the nutritive process, than by irritation. The same may be said of those cases where I have found masses of condensed cellular tissue in the kidney, corresponding to an evident depression on its surface.

2. *Fatty matter.* On opening some kidneys, I have found that their cortical substance, which was pale or yellow, evidently greased the scalpel. The cause of this morbid alteration is unknown, but it seems to depend principally on some special predisposition in the individual to the secretion of fatty matter.

3. *Purulent matter.* It has long been known that abscesses may be formed in the kidney. They are sometimes but of small extent, and the surrounding parenchyma is scarcely altered ; in other cases, the whole organ is converted into a sac filled with pus, which is generally multilocular, and may exceed in bulk the kidney itself, and thus produce a tumour distinguishable through the abdominal parietes. In other cases, on the contrary, the kidney, when transformed into a purulent cyst, is at the same time singularly diminished in bulk ; but this occurs only when it is surrounded by a collection of pus situated in the cellular tissue, or when it is bound down by false membranes produced by a

partial peritonitis. When the sac is multilocu-
lar, the septa often consist of a hard, lardaceous
tissue.

The pus thus formed in the kidney may pass
off by the ureter, or may burst into the cavity
of the peritoneum, or may communicate through
the loins with the surface of the body. The
abscess has also been known, in some few cases,
to open into the colon.

In certain cases, the pus, instead of forming
a collection in the kidney, merely infiltrates its
substance, producing in it a number of whitish
spots, from which a puriform matter may be ex-
tracted by pressure. These whitish spots have
often been mistaken for masses of tubercle, and
described by that name. This kind of infiltra-
tion often co-exists with the presence of puru-
lent collections in other organs, or in the veins.
I have seen several instances of this, but shall se-
lect only one. A boy, aged sixteen, had a large
abscess in the right iliac fossa. On dissection, I
found a whitish mass in one of the kidneys,
which was evidently nothing but the tissue of
the organ infiltrated with pus. Another re-
markable case of the same kind is to be found
in the *Journal Hebdomadaire*, Vol. II. p. 75.

4. *Colloid or gelatiniform matter.* I once
found the whole of the cortical substance of the
kidney transformed into a matter resembling a

strong jelly or solution of starch. There had not been any sign of disease of the urinary passages during life.

5. *Encephaloid matter.* This morbid production has often been observed in the kidney, where it sometimes forms small masses that produce no alteration either in the form or in the size of the organ, and sometimes considerable tumours, that greatly increase its size. I once saw a case in which one of the kidneys was almost wholly transformed into encephaloid matter, and had become at least as large as the right lobe of the liver. The tumour thus formed appeared during life to occupy chiefly the left hypochondrium, and had been mistaken for a tumour of the spleen.

Encephaloid matter is often found in the kidneys, without appearing in any other organ; this, however, is not always the case. It sometimes seems to be deposited in the substance of the organ, and sometimes is found lodged in its small vessels. Thus, in two cases of kidneys that contained masses of encephaloid, I found that the renal vein contained a coagulum, which was in some points remarkably friable, and in others like sanious pus. Pursuing the dissection farther, I found most of the ramifications of the vein filled with the same matter, and at last discovered that what I had taken

for a morbid mass developed in the substance of the proper tissue of the kidney, consisted merely of a number of small vessels containing this altered blood. We have already seen, that such is also the nature of many of these masses in other organs, the lungs, liver, and spleen, for instance. This case, therefore, being analogous, is the more important, and affords additional confirmation to what has been suggested respecting the nature of encephaloid matter.

6. *Tubercular matter* is not often found in the kidneys; and, when it is, generally exists in other organs also; indeed I recollect but one instance to the contrary. Tubercles of the kidneys may be developed, 1. in the cortical substance; 2. in the tubular substance; and, 3. in layers, immediately around the *calices* and *pelvis*. I am not aware of any case on record of tubercles being formed in the parenchyma of the kidney, and subsequently making their way through the walls of the pelvis, and passing off with the urine; but I can conceive such a case occurring.

There is sometimes found in the kidneys, either by itself, or mixed with other morbid productions, a white substance of variable consistence, which, though strongly resembling tubercle, does not appear to be of the same nature as the substance to which that name is usually

applied.   It occurs, however, but seldom, and its nature is not understood.

7. *Entozoa.*   The only entozoa ever found in the human kidneys are hydatids, which have been observed in some few cases, and the *stron-gylus.*   The latter, however, though common enough in animals, especially in the dog, is exceedingly rare in man.

ARTICLE II.

DISEASES OF THE EXCRETORY PASSAGES OF THE URINE.

THESE may be situated in the calices, the pelvis, the ureters, the bladder, or the urethra ; but, as the diseases of the last mentioned part belong exclusively to surgery, I shall give but a slight sketch of them here.

§ I. *Diseases of the Calices, Pelvis, and Ureters.*

The mucous membrane of these parts sometimes becomes congested ; there is often nothing else but this hyperæmia to be discovered, where the patient had been passing purulent or bloody urine, accompanied with pain in the region of the kidneys, and in the course of the ureters.

The same membrane may likewise become thickened, either throughout its whole extent, or in some parts only ; and this alteration may produce a temporary or even permanent oblite- ration of the ureters. In one instance, I found in the pelvis of the kidney a soft, red, fungous tumour, with a broad base, and about the size of a small walnut which seemed to be merely a vegetation from its mucous membrane.

M. Louis mentions a remarkable case in which the walls of the calices, pelvis, and ureters were of more than twice their natural thickness, and their capacity nearly doubled, while the kidneys themselves, which were remarkably pale, were reduced to half their ordinary dimen- sions.

The mucous membrane in this situation may, as in other parts, secrete pus without ne- cessarily being ulcerated. I have seen it covered with a thick layer, like the false membrane of croup. M. Louis mentions a case where the whole of the internal surface of the ureters was lined with a layer of tuberculous matter, which was also found in the pelvis, and in the paren- chyma of the kidney, as well as in the lungs.*

The calices, pelvis, and ureters are capable of becoming extremely dilated, when there is any

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* _Recherches sur la phthisie_, p. 129.

obstacle to the free passage of the urine into the bladder.   The ureters are often found remarkably dilated in various affections of the uterus, in which the cavity of the bladder is diminished by the formation of tumours around it.   On the other hand, when the obstacle to the passage of the urine is situated near the kidney, the portion of ureter below it contracts, and may even become obliterated.

We sometimes observe cases of malformation of the ureters.   Thus, they have been found united by a transverse duct.   Again, two ureters may pass from the same kidney, and either open separately into the bladder, or unite before entering it ; the latter is generally the case.

When the bladder is wanting, or exists only in a rudimentary state, the ureters terminate in some other part.   Thus, they have been known, in such cases, to open into, 1. the umbilicus ; 2. the rectum ; 3. the vagina ; 4. the urethra.   In many of these cases, the diameter of the ureters has been found wonderfully increased, as if for the purpose of supplying the place of the bladder.   The same is sometimes observed in the biliary ducts, when the gall bladder is wanting.

§ II. *Diseases of the Bladder.*

This organ is very seldom found diseased in persons that die of any acute or chronic disease except those of the urinary passages. I make this assertion from my own observation, and it is confirmed by the late researches of M. Louis ; since, in five hundred subjects, he found the mucous membrane of the bladder injected only in six cases, and ulcerated in but one, in which the man had died of typhus fever. It is singular how seldom any part of the urinary apparatus is found altered in persons dying of this disease, considering how frequently they suffer from retention of urine.

A. *Lesions of Circulation.*

The mucous membrane of the bladder, when in a state of hyperæmia, may present various shades of colour ; sometimes it is traversed by an infinite number of minute vessels which give it a bright vermilion hue, which may be either generally diffused over its surface, or appear only in detached patches, or lastly, in small distinct points. When we examine these points attentively, we find that each consists of a red circle surrounding a white space with a small depression in its centre. This kind of injection

appears to belong to the follicles, and resembles one of the varieties of injection of the intestinal follicles already described.

Another kind of colouring, that is sometimes observed in cases of chronic affection of the bladder, is where the internal surface is of a brown or even black tint. This colour is generally accompanied with thickening of the coats, and, in every instance that came under my observation, appeared to result from chronic irritation of the part.

Authors have said a great deal about a varicose state of the veins of the bladder. I am inclined to think that such an affection is at least much more uncommon than has been represented.

B. *Lesions of Nutrition.*

These may affect any one of the coats of the bladder singly, or all of them together. One of the most common is hypertrophy, which I shall in the first place consider as it exists in the mucous membrane.

Hypertrophy of the mucous membrane of the bladder is characterized by a more or less considerable augmentation of its thickness, while, at the same time, it either retains its natural colour, or becomes, red, grey, brown,

or black. The affection may be only partial, producing in the interior of the bladder a variety of tumours, vegetations, and fungous excrescences, that resemble those we have already described as arising from a similar cause in the intestines. These tumours present considerable varieties of texture ; some of them consisting of a hard, homogeneous tissue, apparently destitute of vessels, others, of a soft and highly vascular tissue, while others are formed by a mere prolongation of the natural membrane, so that this portion of the mucous membrane, like all others, presents two varieties of hypertrophy, one in which its substance is thickened but its texture not altered, and another in which its texture no longer retains its natural character. M. Louis, in his *Recherches sur la Phthisie*, has described a very singular lesion of the mucous membrane of the bladder, which resembles that at present under consideration, only so far as that there were tumours on the internal surface of the organ ; but, it would be very difficult to determine its real nature, the case being quite anomalous.

The interesting researches of M. Gendrin have pointed out the remarkable peculiarity of the mucous membrane of the alimentary canal being the only one furnished with villi, or at least, the only one that exhibits them distinctly.

I am, however, inclined to think that the other mucous membranes are not really destitute of villi, but that they are only very slightly developed, from the circumstance of their becoming distinctly apparent in certain morbid states of those membranes. We have already seen an example of their appearing on the mucous membrane of the air passages ; and we owe to M. Louis an instance of the same thing occurring in the bladder. The case I allude to is that of a person who had, for six years, been affected with hæmaturia, without pain in the hypogastrium, or emaciation. On examination after death, M. Louis found the internal surface of the bladder lined with a tissue that floated when put into water, and divided into numerous filaments of from four to seven lines in length, of a fine red colour, and closely crowded together, except in some points where they formed isolated tufts. Now, I think these were evidently villi in a state of hypertrophy.

In the healthy state, the follicles of the bladder are scarcely more apparent than the villi ; but in the morbid state, they also may be enlarged, and become very distinct. They then appear as small round bodies, variously coloured, and often furnished with two vascular zones, one round their basis, the other round the margin of their central orifice : in short, they per-

fectly resemble the intestinal follicles. They are found thus greatly developed chiefly in persons who had been passing urine strongly loaded with a mucous or purulent matter, for some time before death.

The submucous cellular tissue is perhaps more frequently affected with hypertrophy and induration than the mucous membrane itself. When the hypertrophy is inconsiderable, it has no other effect than to produce a slight increase of thickness in the walls of the bladder ; when greater, and at the same time circumscribed, it forms tumours that project into the interior of the organ, and gradually increase to such a size as to occupy its whole cavity.

This same affection may occur in the other cellular layers around the bladder. Thus, some of those hard tumours, called scirrhous, which diminish the capacity both of the rectum and of the bladder, originate in the preternatural developement and induration of the cellular tissue situated between those organs. The same may happen in the cellular tissue which separates the bladder from the genital organs in females.

The muscular tunic of the bladder may likewise be affected with hypertrophy; when this alteration is confined to a certain number of its fasciculi, it gives the internal surface of the organ that peculiar appearance that has procured for

it from French writers the name of *vessie à co-lonnes.*   There is a peculiar variety of this affection in which the hypertrophied fasciculi are disposed exactly like the *columnæ carneæ* in the heart.

In the various cases already mentioned, the hypertrophy of the bladder is the result of disease ; there are others where it appears to be congenital, namely, where we find preternatural septa in the interior.   These septa are sometimes imperfect, and sometimes so extensive as to divide the cavity into two or three compartments.   They are often situated in the median line, thus forming, as it were, two bladders, each of which receives a ureter.   In some cases each compartment opens directly into the urethra ; in others, only one communicates directly with it.   These compartments not unfrequently contain calculi.   They are sometimes   termed   supernumerary   bladders ; but that name more properly belongs to those pouches that are occasionally appended to the bladder, [with which they communicate by an aperture, and with whose parietes theirs are continuous.   I once saw a pouch of this description as large as a hen egg.   These, also, may contain calculi.

The bladder is likewise subject to various degrees of atrophy, some of which are acci-

dental, and others congenital. The atrophy
sometimes consists merely in the walls of the
organ being thinner than usual ; this arises
principally from the imperfect developement of
the muscular coat, which may even be com-
pletely deficient for a considerable space, and
permit the mucous membrane to form a her-
nia through the opening thus formed.

Instead of the walls of the bladder being
merely attenuated, a portion of them may be
completely wanting. It is almost always the
anterior portion that is deficient; and there is
at the same an imperfect developement of the
abdominal parietes, which are open from the
umbilicus to the pubis ; in some cases, the ossa
pubis also remain separate ; and in others, be-
sides the malformations already mentioned, the
genital organs are either absent, exist only in a
rudimentary state, or are badly formed. The
corpora cavernosa, for instance, may be sepa-
rate throughout the whole extent, the upper
part of the canal of the urethra may be open,
&c.

The individuals in whom the anterior wall
of the bladder is wanting present the malforma-
tion known by the name of *ectropia vesicæ*.
This consists of a red tumour of mucous ap-
pearance, situated at the bottom of the abdo-
men, in the place usually occupied by the linea

alba and recti muscles or symphysis pubis, and having its margin continuous with the skin of the surrounding parts. There is a constant trickling of the urine from two points in this tumour, which is merely the posterior wall of the bladder.

I have already spoken of those cases in which the bladder is totally absent, and mentioned the various parts where the ureters then discharge their contents.

The mucous membrane of the bladder is sometimes greatly diminished in its consistence. M. Louis has found it quite soft, without any appearance of increased vascularity or other alteration either in itself or in the other coats of the bladder.

Sometimes all the coats are so completely softened that the slightest pull is sufficient to tear them ; a spontaneous perforation may even take place in this way during life.

Lastly, the bladder, like all other hollow organs, is subject to ulceration. The ulcers may either be confined to the mucous membrane, or may extend deeper, and perforate the parietes of the organ. The urine then, in some cases, escapes into the peritoneum, in others, makes its way directly out of the body through a fistula, and, in others, passes, through the rectum or vagina. It often happens that the

ulceration commences in one or other of the two parts last mentioned, and extends subsequently to the bladder.

C. *Lesions of Secretion.*

These may exist either on the free surface of the mucous membrane, or beneath it.

The mucous membrane may secrete four kinds of fluid, namely, mucus more or less altered in quantity or quality, blood, pus, and a matter which concretes and forms a false membrane on the internal surface of the organ. I have seen two cases of this last kind of morbid secretion, which resembled the false membranes of the air passages.

In the substance of the walls of the bladder, we occasionally meet with pus, tuberculous matter, encephaloid, and melanic matter. In one instance, I found a serous cyst, of the size of a walnut, beneath the mucous membrane.

§ III. *Diseases of the Urethra.*

Some of these lesions are congenital, amongst which are the following.

1. The stoppage of the canal of the urethra. The cause of this may reside either in the prepuce or in the urethra itself, from the agglutination of its parietes, or from the presence of a

membrane that, like a diaphragm, interrupts its continuity.

2. A preternatural opening in the urethra, the usual orifice being at the same time present or not. This malformation in some cases consists of a simple orifice situated under the glans. In others, it is more considerable, extending like a groove along the whole of the inferior surface of the penis, or being even continued under the scrotum. If at the same time the testicles have remained in the abdomen, and the penis is small and imperforate like a clitoris, the sides of the divided scrotum then resemble labia, and the result is an appearance of hermaphrodism.

At the same time that the urethra presents some one of these malformations, it often happens that the urachus is preserved, and the urine passes out by the navel. This duct has also been known to persist where there was no other malformation apparent.

Of the lesions of the urethra that occur after birth, there are some that depend on a simple modification of the capillary circulation of its mucous membrane. Thus, it is found red, but generally without any trace of ulceration, in persons who happen to die while they have a running of purulent matter, whatever be its origin. I must add, however, that in some cases of this affection, whether recent or of long

standing, the mucous membrane of the urethra exhibits no redness on examination after death. In like manner, when a person dies while labouring under sore throat, it often happens, as Bichat remarked, that the pharynx, though red during life, appears pale after death; and, in cases of a chronic discharge from the intestines or bronchia, I have in more than one instance found the mucous membrane of the alimentary canal or air passages perfectly white.*

The urethra is subject to certain lesions of nutrition in its mucous membrane and subjacent tissues, the usual effect of which is to produce various degrees of narrowing of its duct.

The principal lesions of nutrition that affect the mucous membrane are, 1. thickening; 2. vegetations or excrescences (Morgagni, Swediaur); 3. warty granulations (Hunter); 4. cicatrices of ulcers (Dupuytren); 5. fræna extending transversely or obliquely from one side of the parietes of the canal to the other; 6. enlargement of the mucous follicles; 7. preternatural dilatation or other alteration of the lacunæ.

Those that occur beneath the mucous membrane are chiefly varieties of thickening and induration of the submucous cellular tissue.

In all these various cases, a simple contrac-

* *Clinique Medicale.*

tion may be converted for a time into a complete obliteration, by a temporary hyperæmia of the mucous membrane.

§ IV. *Alterations of the Urine.*

This fluid presents many varieties of appearance which belong more properly to the department of semeiology, and consequently do not come within the plan of this work. We are to direct our attention at present to the great changes it may undergo in its composition, which may be reduced to three classes.

The first class comprehends those cases where there is merely a change in the proportion of the natural constituents of the urine.

The second, those in which there are new principles added to the urine, but still such as are found in the blood either in the healthy or diseased state.

Lastly, the third class comprehends those cases where the new principles added to the urine are not to be found in the blood.

I shall devote a distinct article to each class.

A. *Alteration of the Urine from a Change in the Proportion of its Constituents.*

Of all the constituents of the urine, the water is that whose proportion is most variable.

As long as this variation is confined within certain limits, it is compatible with a good state of health; but beyond those, it constitutes disease. There are some individuals in whom, either constantly or at intervals, the urine is almost solely composed of water and a very small quantity of animal matter; this is the chemical characteristic of *diabetes insipidus.*

The urea may also present considerable variations in its proportion. It often exists in much greater abundance than natural; this may easily be discovered by its being precipitated in unusual quantities by the addition of an equal part of nitric acid to the urine. In such cases, there is an increased activity in the secretion of the urine, which has been mistaken for diabetes.

In other cases, on the contrary, the quantity of urea produced is very small. It has been long supposed, from the results of former analyses, that this principle is not to be found in the urine of diabetic patients. However, the late researches of M. Barruel* have proved that this is, at least, not invariably the case, as he found some urea in urine that contained saccharine matter also; so that the presence of the one does not necessarily exclude the other.

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* *Journal de Chimie Médicale.*

Most chemists maintain that the urine naturally contains a certain quantity of free uric acid; while M. Prout thinks that it is in combination with ammonia. Be that as it may, there are certain morbid states, in which this acid certainly exists in the urine in the free state, and in such quantity as to be precipitated in the solid form. Gravel almost always consists of uric acid; and several calculi are also composed of it.

There are other cases where there is not a trace of uric acid to be found in the urine; as in diabetes, the chemical characteristic of which disease appears to be more constantly the absence of that acid than of the urea.

The causes that influence the production of an excess of uric acid in the urine have lately been elucidated by M. Magendie, in his *Recherches sur la Gravelle ;* I have already treated of them in other parts of this work.

The lactic acid, which M. Berzelius asserts to be one of the components of urine, has not been hitherto found altered in its proportion. This is not the case, however, with the phosphoric acid. According to M. Prout, it is in consequence of this acid's not being formed in sufficient quantity, that the salts of which it is the base are transformed into neutral and subsalts, and then precipitated; and hence is the

origin of the calculi composed of phosphate of lime, or of the ammoniaco-magnesian phosphate.

The alkalies that enter into the composition of the urine, namely, potash, soda, lime, and ammonia, may be formed in excessive quantities; this produces no inconvenience in the case of either of the two former; but when it is the lime that is in too great quantity, the salts it forms with the phosphoric acid are precipitated; and, when it is the ammonia, there is also a precipitation of the earthy salts, which were previously kept in solution.

B. *Alteration of the Urine by the Addition of new Principles, that are found in the Blood.*

These principles are of two classes, according as they are constituents of the blood, or occur only accidentally in that fluid.

Those of the first class are albumen, fibrine, and the colouring matter of the blood.

The urine in its natural state does not contain the least trace of any of these principles; but in certain morbid conditions they are found in it either singly or together.

The presence of albumen in the urine is easily detected by the application of heat, which causes it to coagulate. Albuminous urine is

generally pale, and sometimes opalescent when viewed immediately on being passed. Dr. Bright states, that the presence of albumen in the urine is one of the symptoms which indicate a granular state of the kidneys.

The kidneys may also secrete fibrine from the blood. M. Prout saw a remarkable instance of this in a woman aged thirty, who had a voracious appetite, but was otherwise in good health. Her urine consisted almost wholly of a semifluid mass of a pale yellow colour, which was composed of a serous part, and of a solid part which had all the characters of the fibrine of the blood.

It has been asserted that in certain kinds of dropsy the urine contains a great quantity of fibrinous matter. Now, does the cause of such dropsies consist in the alteration of the functions of the kidneys ? Can it be that the subtraction of a quantity of fibrine from the blood by means of those organs, produces this tendency to the formation of serous collections in every part of the body ? If so, it acts like venesection, which, when too copious, or too often repeated, also disposes to dropsy by withdrawing the fibrine from the blood.

As to the colouring matter of the blood, it may be mixed with the urine either in the kidneys, or in the bladder, in which latter it is ex-

haled by the mucous membrane. Exhalation of the colouring matter of the blood often results from irritation of the kidneys or bladder, and is then symptomatic of a purely local lesion. In other cases, however, it is merely one of the phenomena of a general morbid condition, in consequence of which the blood has a general tendency to escape from its vessels ; as in scurvy, certain forms of typhus, &c.

The principles of the second class are either foreign bodies (chiefly colouring or odorous matters) that have entered the blood by the stomach or lungs, and are got rid of by the kidneys, or else the elements of various secreted fluids that have remained in the blood or re-entered it, and afterwards pass out along with the urine. The principle of this latter description most frequently observed in the urine is the yellow matter of the bile ; it has been asserted that caseous matter has also been found in it.

C. Alteration of the Urine by the addition of New Principles that are not to be found in the Blood.

These are chiefly the following :—

1. Acids. Amongst these is oxalic acid, which seizes on the lime contained in the urine, and forms with it a particular species of calculus. In some cases mentioned by Prout, Magendie, and Ratier, the formation of oxalic acid in the

urine was evidently owing to the immoderate use of sorrel as an article of food. In other cases, the cause of its formation is unknown. Berzelius thinks it results from an increased activity in the functions of the kidneys, which according to him consist chiefly in a process of acidification.

Brugnatelli asserts that he has found hydro-cyanic acid in the urine.

2. Oxides. Of these there are two, which have nothing analogous to them in any other part of the system : they have received the names of cystic and xanthic oxides.

3. Colouring matters. The black tint some-times observed in the urine has been attributed by Prout to the presence of melanic acid ; and the red tint to that of purpuric acid. The urine has occasionally been observed to have a blue tinge, and, in one case of this description, M. Julia Fontenelle,* detected hydrocyanate of iron in it.

4. A saccharine matter, like the sugar of grapes. The presence of this matter is the chemical cha-racteristic of diabetes mellitus. It was formerly supposed that when this matter occurs in the urine, it is to be found in the blood also ; but more recent researches seem to prove the con-

* *Archives de Médecine*, Vol. II. p. 104.

trary: I think, however, the question is not yet settled conclusively. The causes that influence the secretion of this substance are still unknown.

5. A fatty matter. M. Prout found, in one instance, a substance like butter in the urine.

6. Hair. The remarkable fact of the occasional occurrence of hairs in the urine, which was long since pointed out by some of the older medical writers, has been put beyond all doubt by the cases lately published by M. Magendie.* I saw, myself, one of the two cases he mentions. A great number of small hairs, varying in length from a line to upwards of an inch, were mixed with a white powder, which was found to be composed of a great deal of phosphate of lime, a little phosphate of magnesia, and some traces of uric acid. The subject of the case was an old man, who was accustomed to a temperate mode of life. According to M. Magendie, he used to pass nearly a pint of the mixture of saline substances and hairs every day. The other patient mentioned by Magendie used to void with the urine concretions covered with hairs.

Amidst these various alterations of the urine, the kidneys may either present some one of the

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* *Recherches sur la gravelle,* 2nd edition.

lesions already described, or appear perfectly sound, notwithstanding the alteration in the fluid they secrete. The reason of this is, that the cause of its modification very frequently exists, not in the secreting organs, but elsewhere, as in the state of the blood, or of the innervation, in the assimilative functions, or in the qualities of the air and food ; none of which it is evident are appreciable on dissection.

The various changes in the composition of the urine above enumerated produce also various changes in its physical properties. In some cases they leave its fluidity and transparency unaltered ; in others, they render it turbid, or give it an unusual colour; and, in others, they form in it solid bodies, which are called gravel when in grains, and calculi when concreted in masses of various sizes. These calculi are found, 1. in the calices and pelvis ; 2. in various parts of the ureters ; 3. in the bladder ; and, 4. in the urethra.

The elementary substances that have been hitherto found either single or combined in urinary calculi, are eleven in number, viz. uric acid, urate of ammonia, phosphate of lime, ammoniaco-magnesian phosphate, oxalate of lime, silica, cystic oxide, xanthic oxide, a mucous substance, a fibrinous substance, and hair.

APPARATUS OF GENERATION.

As a great many of the diseases of this appa-
ratus belong to the pathology of the exterior, I
shall notice them in a very cursory manner, the
plan of this work allowing me to dwell only
upon such lesions as are connected more parti-
cularly with the pathology of the interior.

SECTION I.

DISEASES OF THE MALE GENITAL ORGANS.

I SHALL just give a rapid sketch of these le-
sions as they affect the several component parts
of those organs.

Besides the hyperæmia accompanied with
more or less of tumefaction that is often observed
in the testicle, it is subject also to certain alter-
ations of nutrition and secretion, which will best
be understood by following them successively
through the various investing membranes to the
substance of the organ itself.

1. *Cutaneous envelope of the testicle.* The
most remarkable alteration presented by this
part is a considerable induration of its tissue,

succeeded by ulceration ; this is the disease known by the name of *chimney-sweepers' cancer*.

2. *Dartos.* This cellulo-fibrous layer occasionally undergoes alterations similar to those we have so often studied in the various portions of the cellular tissue subjacent to the different membranes. Thus, it may become thickened, or indurated, may secrete coagulable lymph, pus, or tubercle, and may, in consequence of any of these alterations, form tumours which have often been mistaken for an affection of the proper substance of the testicle. Many cases of sarcocele appear to consist merely of some of these alterations of the dartos.

3. *Tunica vaginalis.* This, being a serous membrane, is subject to the same lesions as the rest of its class. Thus, in the disease termed hydrocele, we find it containing a collection of serum, without being itself appreciably altered. In some cases, the cause of this collection of serum cannot be accounted for ; in others, it consists either in an obstacle to the free return of the venous blood along the spermatic cord, or in some organic lesion of the testicle itself; just as tubercles in the brain often produce hydrocephalus. There has been sometimes found in the fluid of hydrocele a small quantity of cholesterine, in the form of brilliant yellow scales : this is an interesting fact, as it proves that the

secretion of that substance is not confined ex-
clusively to the liver.   The fluid is not always
pure serum, being often turbid, flocculent, or
purulent.   The surface of the tunica vaginalis
is occasionally covered with membraniform lay-
ers, and adhesions are often formed in different
parts of it.

4. *Tunica albuginea.*   This membrane plays
an important part in some diseases of the testi-
cle, being sometimes found to be the only part
affected, in cases in which, during life, the ex-
istence of a hard, uneven, and painful tumour
of that organ, had led to the supposition that its
parenchymatous structure was diseased.   In
such cases, the membrane is sometimes merely
in a state of hypertrophy and induration, and
sometimes cartilaginous, and, in some points,
even osseous.   It is probable that in this case,
as in others where a fibrous lines a serous mem-
brane, that the alterations apparently seated in
the former membrane are in reality situated in
the intermediate cellular tissue.   Such, for in-
stance, is the situation of certain abscesses that
are sometimes found beneath the tunica vagina-
lis, pushing back the tissue of the testicle with-
out involving it.   I once found a layer of tuber-
culous matter thus interposed between the two
tunics ; and in another instance, I found a cal-
culous concretion of the size of a nut in the

same situation. In the greater number of cases where there is any alteration either of the albuginea or of the cellular tissue that unites it to the tunica vaginalis, hydrocele is produced, but it is generally slight.

5. *Parenchyma of the testicle.* The principal alterations that have been discovered in this are :—

A. A simple state of hyperæmia with more or less tumefaction.

B. Grey or white induration of the parenchyma, the *tubuli seminiferi* still remaining visible.

C. The same kind of induration, the tubuli having disappeared. The testicle then loses all traces of its primitive organization, and becomes a hard, homogeneous mass. This induration is sometimes general, and sometimes only partial : in the latter case it is often confined to the epididymis.

D. Encephaloid masses in the substance of the testicle, with all possible degrees of induration or softening.

E. The developement of an accidental erectile tissue, which sometimes occupies only some isolated points of the organ, and sometimes involves the whole of it. I have already given in detail the case of a man who died at *La Charité*, a few months after having undergone the opera-

tion of castration for an erectile tumour of the testicle, and in whose lungs I found a number of tumours of the same description.

F. Collections of pus, which, in some cases are unaccompanied by any other lesion, and in others are merely the result of the alterations already described.

G. Tuberculous matter. This occurs in the testicle in all its varieties of form ; sometimes it is hard, and exists in the form of a number of minute grains, or of one large mass which projects from its external surface ; and sometimes it is softened and transformed into a fluid matter, which endeavours to effect its escape through fistulous openings in the investing tunics of the organ.

M. Reynaud has informed me that he lately discovered in a testicle a number of small hard semi-transparent granulations resembling those found in the lungs ; a fact which would lead us to conclude that the pulmonary granulations may arise from some other cause than chronic induration of the air vesicles. The subject, however, requires farther investigation.

The principal alterations of the vas deferens are, obliteration of its canal, dilatation of the same with or without thickening of its parietes, the existence of purulent fluid in its interior,

and the formation of a layer of tuberculous matter on its external surface. I saw a case of the last mentioned alteration, in a man whose testicle was full of tubercles. It is probable that, in the organ itself, the tuberculous matter was deposited on the outside of the tubuli seminiferi.

The vesiculæ seminales are sometimes imperfectly developed. Meckel mentions instances of there being but one. Tuberculous matter has been found in their parietes, and they occasionally contain pus and calculi. In some instances there is an accidental communication established between them and the interior of the bladder.

The prostate is often enlarged without exhibiting any other alteration than simple hypertrophy of its tissue. This hypertrophy may be general, or confined either to one of its lateral parts, or its middle portion (the middle lobe of Sir E. Home). In other cases, the enlarged prostate loses its natural appearance, and becomes a homogeneous mass, which is then said to be scirrhous. We often find in it fibrous, cartilaginous, or ossiform bodies, resembling those found in the uterus. In many cases of suppuration of the prostate, all the symptoms of severe fever have been

observed, although there was no lesion of the stomach or intestines.*

As to the various lesions of the penis, they have been already so frequently and minutely described, that it is quite unnecessary to recapitulate them here.

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* *Clinique Medicale.*

SECTION II.

DISEASES OF THE GENITAL ORGANS OF THE FEMALE.

CHAPTER I.

Diseases of the Uterus.

OF the lesions discovered in this organ on dissection, there are some that belong specially to the province of surgery or midwifery, such as the various displacements of the body or neck of the uterus, and certain alterations of conformation, which are generally congenital. Of these I shall give but a very summary description here.

1. *Obliquity of the uterus.* This may exist without any known cause ; in other cases it results from adhesions formed between the uterus and lateral parts of the pelvis.

2. *Retroversion of the uterus.* The fundus of the organ is then directed downwards and

backwards, and its neck upwards and forwards. This occurs most frequently during pregnancy.

3. *Anteversion of the uterus,*—exactly the reverse of the preceding.

4. *Inversion of the uterus.* This lesion consists in the organ's being turned inside out ; there is always at the same time a greater or less degree of prolapsus of its body, which in some cases only projects slightly beyond the cervix uteri, and in others appears without the vagina : the tumour thus formed presents no orifice, which distinguishes it from that formed by a simple prolapsus. Inversion of the uterus happens only when its cavity is distended at the same time that its parietes are diminished in thickness ; hence it generally occurs during delivery, or in those cases where accidental productions of considerable size are developed in its cavity.

5. *Prolapsus uteri.* In this lesion, the uterus protrudes through the vagina, and forms a tumour between the thighs, in which the orifice of the neck is almost always discoverable. Its most common cause is inversion of the vagina.

6. *Hernia of the uterus,* whether empty or gravid.

7. *Bilocular state of the uterus.* Of this there are several varieties. In the first, the uterus has two horns or lobes, as in many of the mammalia ; and its neck is divided by a septum

into two compartments, each terminating in its respective lobe. In the second variety, the septum is absent, but the lobes remain. In the third, there are no lobes, but the cavity of the organ is divided into two by a septum which terminates near the neck. Lastly, in the fourth variety, the bilocular state of the uterus is only apparent, being produced by a groove in its upper margin on the median line; and the interior of the organ presents no sign of division. The septum described in the three first varieties may be continued into the vagina, even to its external aperture, and is then composed of a doubling of the mucous membrane.

This malformation of the uterus does not prevent the full developement of the fœtus. One woman in whom it was found had had a child, which had come to the full time, but died in coming into the world. Another, whose case is recorded by M. Ollivier,* after having had two dead and two living children, became a fifth time pregnant, and, when she arrived at the full period of her pregnancy, was suddenly seized with symptoms of acute peritonitis, under which she sunk. On examination, it was found that the lobe that contained the fœtus had burst.

8. *Imperfect developement of the uterus.* Of

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* *Archives de Médecine,* vol. VIII. p. 215.

this, also, there are several varieties. In one of these, half of the organ is wanting, and there is at the same time but one ovary, and one fallopian tube. In a case of this description observed by Chaussier, the woman had had several children, who all came to their full time. In another variety, the uterus is so small that it requires some attention to find it, the vagina merely terminating in a small, hollow swelling, into which open the fallopian tubes. In another, again, the neck of the uterus, which is of the natural size, is much larger than the body of the organ. M. Lauth, of Strasburg, mentions a case of this description, in which the fallopian tubes opened almost immediately into the neck, being separated from it only by a small cavity with thin membranous parietes. There was merely a rudiment of the ovaries to be found. The pelvis and the mammæ resembled those of a man.

9. *Complete absence of the uterus.* A case of this was lately discovered at the *Hôtel-Dieu,* by M. Dupuytren, in a woman aged twenty-seven. The vagina did not exceed an inch in length, and behind the *cul-de-sac* in which it terminated, the rectum only was to be found. Above and behind the bladder were found the ligamenta lata, containing as usual the fallopian tubes and the ovaries, which were both well formed.

Where the two tubes met, there was a small tumour which had neither aperture nor cavity, and bore no resemblance whatever to the uterus. The mammæ were well developed, the external genital parts well formed, and there was nothing masculine in the appearance of the woman. She had never menstruated.

10. *Obliteration of the various orifices of the uterus.* We sometimes find the uterine orifices of the fallopian tubes completely stopped up. This arises in some cases from the continuation of the mucous membrane over these orifices; in others, from the presence of a particular membrane which closes them; and in others, from the obliteration of the tubes, for the extent of a few lines. The neck of the uterus may likewise be closed, either from the stoppage of its vaginal or uterine orifice by a membrane, or from the agglutination of its parietes. In some cases, while the two orifices of the neck are diminished in size, its cavity is enlarged, or at least retains its natural dimensions.

We are now to turn our attention to those alterations of the uterus which belong more particularly to the pathology of the interior.

Hyperæmia of the uterus is sometimes observed unattended by any other lesion of the organ. It may occupy its whole substance, or be confined to its internal surface. In the lat-

ter case, the mucous membrane that lines the uterine cavity becomes highly vascular, and separates from the subjacent tissue, so as to afford ample proof of the existence of such a membrane.

After puberty, the uterus becomes every month the seat of a hyperæmia which soon passes away without producing any unpleasant effects. In some females, however, each return of this monthly hyperæmia is attended with pains in the region of the uterus, and often with some degree of fever. But when the hyperæmia, instead of resulting from the laws of physiology, supervenes as a morbid affection, the sympathetic derangement becomes much more serious, although the hyperæmia is not more considerable in the latter case than in the former. Thus, in many women that die shortly after their delivery, of acute peritonitis, which has evidently arisen from irritation of the uterus, we cannot discover any thing in that organ but a redness (and that often but slight) either of its substance, or else merely of its internal surface. In other cases, however, most serious effects are produced; and the tissue of the uterus becomes tumid, changes its consistence, and supurates.

Tumefaction of the body or neck of the uterus at first arises from sanguineous congestion,

and may disappear along with the congestion,
or remain after it. In the latter case, the ute-
rus, at the same time that it retains its increased
size, becomes either indurated or softened; for
both of these effects may arise from the same
cause.

Induration of the uterus takes place very
slowly; while, on the contrary, its softening
may occur in a short space of time. It often
happens that, in women who die in a very few
days after presenting symptoms of irritation of
the uterus, its walls are found so much softened
as to be readily perforated by the finger; indeed,
they sometimes become so very soft as to rup-
ture spontaneously, especially when the uterus
is gravid.

While the tissue of the uterus thus loses its
consistence, it sometimes becomes the seat of
suppuration. The pus may either be infiltrated
through it, or collected into one or more absces-
ses of various sizes, from that of a pea to that of
a walnut. In some cases the whole tissue of the
uterus seems as if it were steeped in pus. When
these collections are more limited, the portion of
tissue which surrounds them in some cases re-
tains its usual firmness; sometimes it is of a
bright red, or violet colour, and sometimes grey-
ish, yellowish, or even remarkably pale.

The pus may be situated either in the sub-

stance of the uterus, or in its cavity. In the former case the suppuration may take place either in the parenchyma of the organ, or in its veins, which are then often so much dilated as to be mistaken for accidental cavities. A great number of veins of the uterus are sometimes found thus filled with pus ; these convey it into the neighbouring vessels, and it is not unusual in such cases to find it also in many of the hypogastric veins, in the vena cava, and in the parenchyma of various organs, where it is deposited in its passage with the blood from the uterus through the various parts of the venous system.

Pus is more seldom found in the cavity of the uterus than in its substance. In the greater number of these cases, it appeared to me that the progress of the morbid process that produced it had not been acute ; indeed, in some cases, there had not been any symptoms observed that could be referred to the uterus or its appendages. Such, for instance, was the fact, in the case of an old woman who died of phthisis at *La Charité*, without having ever complained of any thing that could lead to the suspicion of the organs of reproduction being diseased ; and in whom, notwithstanding, we found the uterus filled with pus, and its interior lined with a

whitish, membraniform layer, beneath which the mucous membrane was highly vascular.

Such are the principal lesions of the uterus that result from acute irritation. Let us now turn our attention to those which either result from chronic irritation, or occur without any discoverable previous irritation.

Amongst these is softening; but it appears in a very different form from that just described as accompanying acute hyperæmia of the uterus. It sometimes happens that, on examining the bodies of women who have died of some disease quite unconnected with the uterus, we are greatly surprised to find that organ remarkably pale and flaccid. It may be torn as easily as the tissue of the spleen, and in some parts is even transformed into a kind of semifluid pulp. This softening is sometimes partial, and sometimes general; in which latter case the parietes of the organ are often remarkably attenuated. As to the cause of this affection, we are quite in the dark: irritation and atony are equally hypothetical. All we can say of it is, that it bears a great resemblance to similar affections already described in the heart, liver, stomach, and kidneys, the cause of which is equally inexplicable.

There is, again, another kind of softening of the uterus, which generally attacks its neck, and transforms its tissue into a black and fetid

putrid mass. This putrid softening is sometimes the only lesion to be discovered in the uterus; it may occupy, 1. a few lines only of the outer extremity of the neck; 2. the whole neck; or, 3. a certain portion of the body. In other cases it supervenes at a certain stage of ulceration of the neck of the uterus, or takes place around encephaloid masses formed in its substance.

The uterus is also subject to ulceration in various parts. One of the varieties of the disease known by the name of *cancer of the uterus* is merely ulceration of its neck, occurring without being preceded by any of those accidental productions termed scirrhus and encephaloid. The only preceding affection is a tumefaction of the neck of the uterus, which in many cases is very slight, though it is sometimes so considerable as to produce inequalities and protuberances on its external surface, as well as on that of the vagina. When the ulceration has once commenced, it may either remain stationary for an indefinite period, or extend its ravages, and destroy the whole of the neck, or even extend to the body of the organ. A superficial ulcer of the neck of the uterus is often attended with very severe pain, while a very destructive one may be almost completely indolent.

Ulcers of the neck of the uterus and of the vagina, especially the latter, may burrow so

deep as to produce a perforation of those parts
as well as of the rectum or bladder. Hence
arise those vesico-vaginal or recto-vaginal fistulæ,
that are so common in cases of cancer of the
uterus.

There is another variety of cancer of the
uterus, in which the ulceration is only consecu-
tive, and whose anatomical character is the de-
velopement of encephaloid matter in the sub-
stance of the organ. This matter may be de-
posited, 1. in the neck alone ; 2. in the body,
the neck remaining perfectly sound ; 3. in both
these parts at once ; 4. in the cellular tissue that
unites the uterus to the surrounding parts, espe-
cially the rectum and bladder. In this latter
situation, we often find it forming large tumours
around the cervix uteri and vagina, which press
upon the rectum or bladder, and sometimes
project so considerably into the bladder, that its
cavity is almost completely obliterated ; in such
cases, the ureters are generally found greatly
dilated. The developement of encephaloid is
much more common in the neck than in the
body of the uterus, the latter being often perfect-
ly sound, while the former is distended by im-
mense masses of this accidental production,
some of which have been found of such enor-
mous size as to be five or six times larger than
the whole organ itself.

The morbid production just described cannot exist in the uterus without producing the most serious derangements in the whole system; and death is, inevitably, the ultimate result. There is, however, another accidental production which has long been confounded with the preceding, though differing from it both in its anatomical characters, and in its comparative harmlessness : I mean that which forms the fibrous tumours of the uterus. While a mass of encephaloid of scarcely the size of a walnut would be productive of the most dangerous effects, the fibrous tumours may even exceed in size the organ itself, without producing pain, alteration in the general nutritive process, or, in a word, any sympathetic affection whatever.

Fibrous tumours present the same structure in the uterus as in the other parts of the body. They are composed of fibres rolled up and matted together ; these bundles of fibres are divided into several lobules separated from each other by loose cellular tissue in which the blood-vessels run. Such is the commonest form of these tumours, but it is not uncommon to find them conjoined with others which are likewise denominated fibrous tumours, though in reality they have no fibrous structure whatever, being composed of a number of granules surrounded each by a layer of cellular tissue, and divisible

into still smaller grains possessing each a similar investment. The appearance of these tumours bears a strong resemblance to that of the pancreas. They present three principal varieties of colour, namely, a reddish, a white, and a yellowish tint. As to size, they are very variable, some of them being no larger than a pea, and others surpassing in size the head of a full grown fœtus, and thus forming a tumour which in some cases projects into the vagina, and in others may be discovered through the walls of the abdomen. Their form is generally globular, but their surface is occasionally studded with small knobs or marked with deep fissures. Their number is indeterminate, there being sometimes but one, and sometimes several scattered through the substance of the organ : in the latter case, we often find similar tumours in the ovaries, and even in the ligamenta lata.

These fibrous tumours are not all of the same density. Some of them are soft, and to a certain degree compressible ; others are much harder, and cannot be cut into without difficulty. When this induration advances a little farther, the tumour becomes cartilaginous in some points, and osseous, or, more strictly speaking, calcareous, in others. This transformation generally commences in the centre of the tumour ; and the surrounding tissue then assumes a remarka-

ble yellowish tint. It afterwards gradually spreads to other parts, and sometimes, though rarely, involves the whole tumour.

With respect to their situation, fibrous tumours of the uterus may be divided into three classes.

Those of the first class are situated outside the uterus, between it and its peritoneal covering. These never grow at the side next the uterus, and consequently compress it but slightly, all their increase of bulk being in the direction of the abdomen.

Those of the second are situated in the substance of the uterus. They always grow towards that surface of its parietes to which they are nearest; but, if they happen to be lodged in the centre, it is remarked that they remain much longer stationary than when situated near either surface. They are much more frequently found in the body of the uterus than in its neck.

Those of the third class are developed between the internal surface of the proper tissue of the uterus and its lining mucous membrane, which then becomes more distinct than in the natural state, by being detached from the subjacent parts. As they increase in size, they continue to push this membrane before them, invest themselves in it, and project into the interior of the cavity of the uterus, and sometimes

even into the vagina.   At last, they often cease
to be in contact with the walls of the uterus, be-
ing attached to them only by the investing mu-
cous membrane, which is lengthened out so as
to form a kind of stalk or pedicle.   This mucous
pedicle, which exists only in some cases, may be
broad or narrow, several lines in length or very
short, and furnished or not with distinct vessels.

The three classes of fibrous tumours just de-
scribed are all united in the same manner to the
tissue of the uterus, namely, by very loose cel-
lular tissue, so as to be capable of being removed
with the greatest ease, without injuring the sub-
stance of the organ.   When they are of mode-
rate size, the organ continues in every other
respect the same as in the healthy state ; but
when they become larger, they alter both the
size and texture of the organ.   The bulk of the
uterus often becomes very considerable in those
cases where the tumours are developed on its
internal surface, its cavity then enlarging as if
it contained a fœtus ; and at the same time the
tissue of the organ assumes the same appear-
ance as it does in the gravid state.   As to the
mucous membrane, it is sometimes pale, and
without any appreciable alteration, and some-
times more or less vascular.   In cases where
there were several fibrous tumours in the uterus,
I have occasionally found its cavity filled with

fluid or partly coagulated blood, beneath which the mucous membrane was merely somewhat redder than ordinary.

These tumours are not formed in the uterus with equal frequency at all ages. They are rarely met with before the age of thirty; while they are very common in old women. Bayle has calculated that in every hundred women who die after five-and-thirty, there are at least twenty who have these uterine tumours; it is thought that they occur most frequently in those persons who have not had children, or have remained unmarried.

We occasionally meet with serous cysts of various sizes in the walls of the uterus, especially about the cervix, where they sometimes exist in hundreds, and project into the interior of the organ.

Tuberculous matter is sometimes found in the same situation. This, however, occurs but very rarely, and mostly in cases where it is also deposited in many other organs.

The various morbid productions just enumerated are all situated beneath the mucous membrane of the uterus, and, consequently, on the outside of its cavity. But there are others situated within its cavity, which arise from a morbid condition of its lining membrane. We have already seen that the mucous membrane

is capable of secreting pus, and also a substance which concretes on its surface, and thus forms a layer that sometimes presents traces of organization. Besides these, however, we find attached to its internal surface certain morbid productions, which all agree in adhering to it more or less closely, but differ greatly both in their origin and in their internal structure.

With respect to their origin, they are of two kinds; some having been at first merely a coagulum of blood, that gradually assumed a determinate form and organization, and others appearing to result from an alteration in the nutrition of the membrane itself. In certain cases it is easy enough to distinguish between these two kinds of productions; but, as they advance, they come to resemble each other, so as to be at last distinguishable only in theory.

With respect to their form and structure, they generally appear as polypous vegetations projecting from the internal surface of the uterus.

Many of these polypi appear to be mere prolongations of the mucous membrane, of which they assume all the varieties of appearance. They are sometimes very short, and in some instances are of such a length as to reach from the fundus of the uterus into the vagina. In some cases their free extremity contracts adhesions with some point of the parietes of the cer-

vix uteri or vagina, and thus they become fixed at both ends. They are sometimes only as thick as the mucous membrane from which they grow, and sometimes much thicker; in like manner they may be equally soft with that membrane, or else much harder. Again, they may be slightly vascular, or may contain such a number of vessels as to present the appearance of an erectile tissue. This excessive vascularity is often confined to their free extremity, the other remaining like the mucous membrane from which it arises.

There are other polypi of a much more complicated structure. Some of these consist of a reddish mass containing cells of various shapes filled with different fluids. In an elderly woman, I found a polypus of the size of a walnut, composed of a white, semi-cartilaginous substance, divided into a great many cells, which contained another substance resembling thin colourless jelly. It was attached to the uterus by a very narrow stalk. The cervix uteri was full of small cells containing the same jelly-like substance. In another woman, aged sixty-six, I found the fundus of the uterus occupied by a reddish, and very vascular body, of about the same size as the one just described. It was closely adherent to the mucous membrane, and presented a great many cells filled with a colour-

less and slightly viscid serous fluid. The parietes of these cells consisted of numerous filaments or laminæ, some red, and others of a dead white colour, and fibrous texture. In other cases, instead of a tumour intersected with cells, we find distinct cysts, that are merely attached to each other by cellulo-vascular stalks. I have often seen vegetations of this description adhering to the internal surface of the uterus by a broad or narrow stalk, and consisting merely of a crowd of small vesicles filled with a transparent fluid, and clustered together pretty much as a bunch of grapes. In some instances they have appeared to me to be completely independent of any placental connexion with the uterus.

We sometimes find deposits of phosphate of lime in these vegetations. I saw a remarkable instance of this in a middle aged woman, whose uterus contained a pear shaped body which adhered to its mucous membrane by a slight pedicle. It was very vascular, and consisted of a kind of fleshy substance; near its centre was a hard concretion, apparently composed of phosphate of lime. It appears that similar concretions have been found loose and unattached in the cavity of the uterus, and in some cases have been discharged during life. In a case related by Brugnatelli, there was found in the uterus a

calculus weighing two ounces, the nucleus of which was a fragment of the tibia of a fowl. The same author found another uterine calculus composed of phosphate of lime and ammoniaco-magnesian phosphate.

The mucous membrane of the uterus, instead of presenting any of the lesions of secretion or nutrition above described, may furnish its natural secretion in greater abundance than ordinary. When the orifice of the organ is free, the fluid generally flows out as fast as it is secreted; sometimes, however, it first accumulates to a certain extent in the uterine cavity, and then comes away in gushes at intervals : in such cases its natural viscidity is diminished, and it resembles serum more than mucus. But there is another, more uncommon, case, namely, where the os uteri happens to be closed : a great quantity of fluid may then accumulate in the organ, which gradually increases in size as if it were in the gravid state. This is the affection that has been termed dropsy of the uterus, or *hydrometra*. There is a remarkable case of it related by Dr. Thompson of London in the Medico-chirurgical Transactions, (vol. xiii.) The uterus was fully as large as if it contained a full grown fœtus. On its being opened, there issued from it about eight quarts of a brownish fluid, slightly coagulable by heat ; the only alteration

observed in the organ was the complete obliter-
ation of the os uteri.

Lastly, gases may accumulate in the cavity
of the uterus, and distend it so as to produce the
appearance of pregnancy. These gases gene-
rally result from the decomposition of the coa-
gula. In some cases, however, there are no coa-
gula, and it appears that they are then exhaled
by the uterine mucous membrane, just as they
often are by that of the alimentary canal. A
few cases have been recorded of the escape of
great quantities of gas by the vulva occuring in
acute metritis. In such cases, the gaseous ex-
halation from the mucous membrane of the
uterus is connected with irritation of that mem-
brane : but there are also cases where this ex-
halation takes place without being preceded by
any symptoms of inflammation, in consequence
of some modification of the innervation ; and
it is in these cases that its secretion is the most
abundant.

CHAPTER II.

Diseases of the Fallopian Tubes.

THESE are few in number, but deserving of
considerable attention, as they may have great

influence on the developement of the product of conception. They consist of, 1. preternatural adhesions of the free extremity of the tubes; 2. various changes in their capacity; or, 3. the presence of morbid productions in their parietes, or in their cavity.

I have sometimes found the fringed extremity of one of the tubes adhering to the ovary of the same side; in some instances this was the sole lesion; in others, it was merely a result of acute or chronic peritonitis. There are many facts of the same kind to be found described in authors.

Dilatation of the fallopian tubes seldom occurs except in consequence of the accumulation of a morbid fluid. Obliteration of their cavity is not very uncommon, and may take place, 1. throughout its whole extent; 2. towards its middle portion only; 3. at its uterine extremity; 4. at its ovarian extremity. It may arise from various causes, such as the existence of a transverse septum in the tube, the stoppage of its uterine orifice by an accidental membrane lining the interior of the uterus, different alterations of texture of the *fimbriæ*, or an accidental or congenital agglutination of the parietes of the tube.

Tuberculous or encephaloid matter, serous cysts, and calculous concretions, may occur in the substance of the fallopian tubes; and their

cavity may contain an enormous accumulation of mucus or serum, which constitutes the disease described as dropsy of those tubes. In order that this accumulation should take place, it is necessary that both orifices of the tubes should be closed. In some cases of this disease, the cavity of the affected tube is wonderfully enlarged, so as to contain several pints of fluid.

Instead of serum, we occasionally find pus in the fallopian tubes, which sometimes produces only a slight dilatation of their cavity, such as to admit the introduction of a quill, for instance; and in other cases is accumulated in such quantities as to convert the tube into a tumour of considerable size. This may occur without there being any disease in the corresponding ovary, or in the uterus; but in general these three parts are affected together.

The pus thus collected in the fallopian tubes may escape, 1. into the peritoneum; 2. between the folds of the ligamenta lata; 3. into the uterus; 4. into some of the adjacent hollow organs, such as the bladder or rectum, particularly the latter. I saw lately at *La Charité* a remarkable instance of the communication of an abscess in one of the fallopian tubes with the rectum. There is an accurate account of it to be seen in the *Journal Hebdomadaire de Medecine*, (Vol. I. p. 114).

CHAPTER III.

Diseases of the Ovaries.

Of the various alterations presented by these organs, some appear to affect chiefly their fibrous envelope, others their parenchyma, others, again, their vesicles, or at least to have originated there, and lastly, others, to be confined to no one particular part, but to involve them all.

The ovaries are not unfrequently affected with acute or chronic hyperæmia, producing a redness of their parenchyma which is sometimes general, and sometimes confined principally to the walls of the little cells that contain the ova, which then appear surrounded with a sort of red or brown areola. When the congestion of the ovary is at all considerable, it produces an enlargement of the organ, which sometimes acquires an enormous size in a very short space of time. We then observe, during life, a tumour situated above the pubis and at one side of the median line, to which it approaches as it increases in size, which it sometimes does very rapidly; it may rise several finger's breadths above the margin of the pelvis, and, being more or less moveable, and of a rounded form, might easily be mistaken for the gravid uterus inclined

a little to one side. Both ovaries may be thus affected at the same time. When examined after death, their tissue is found to be red, gorged with blood, and friable. It sometimes contains effused blood, and sometimes pus, either infiltrated or collected in abscesses.

Suppuration of the ovaries is not always connected with a state of hyperæmia so considerable as that now described. On the contrary, the ovary is often gradually transformed into a sac full of pus by an obscure chronic process, without any appreciable tumefaction, and sometimes even without pain. At the same time its fibrous capsule may become softened, and, eventually, perforated, and unless adhesions have been previously formed between it and the neighbouring organs, the pus escapes into the peritoneum. On the other hand, if there happen to be adhesions between the ovary and the uterus, vagina, bladder, or a portion of intestine, the parietes of the adhering part become ulcerated from without inwards, and the ovarian abscess opens into its cavity. I once found a communication of this nature between one of the ovaries and the bladder, in a young woman who died thirty-seven days after her confinement.

Abscesses of the ovary sometimes acquire a very considerable size. In the *North American*

Medical and Surgical Journal for 1826, there is a case of a woman who had a tumour in the abdomen, which, during life, was considered to result from encysted dropsy of the ovary. On dissection, it was ascertained that the tumour was in fact formed by one of the ovaries, which occupied a great part of the abdomen, and weighed seventeen pounds ; but the disease was not encysted dropsy, the entire organ being converted into a vast sac containing twenty pints of pus.

The ovary is subject to numerous alterations of nutrition and secretion, either subsequently to irritation and active hyperæmia, or without any previous symptom of those affections.

In the first place, its fibrous envelope is sometimes found so thickened as to constitute almost the whole of its bulk, and sometimes, transformed into cartilaginous or osseous tissue.

The parenchyma of the ovary likewise may be affected with hypertrophy producing an increase in its bulk and density. In other cases, on the contrary, it falls into a state of atrophy, and is then reduced to a small cellulo-fibrous mass, that is almost lost in the tissue of the ligamenta lata. Atrophy of the ovaries is, however, a morbid condition only when it takes place prematurely ; for it is so common in old age,

that it may then be considered as the natural state of the parts, which waste away, having no longer any functions to perform.

We frequently find new formations in the substance of the ovaries. These are sometimes masses of encephaloid, and sometimes fibrous bodies. The latter are at first scarcely as large as a grain of millet, but afterwards gradually increase in size, so as at last to become much larger than the ovary itself, of which there is then no vestige distinguishable. Some of these fibrous bodies are developed in the midst of the organ, others on its surface, and others merely adhere to its membranous envelope by a long and slender pedicle. They may be combined with amorphous masses of a cartilaginous or osseous substance, just as in the uterus.

The vesicles scattered through the parenchyma of the ovary are occasionally the part principally affected. Blood is sometimes exhaled, or various colouring matters secreted, around them or in their interior.* In other cases they become distended, enlarged, and at last transformed into cysts, which present infinite varieties with respect to their size, their number, the anatomical composition of their parietes, and the qualities of the fluid they contain.

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* Vide Vol. I, p. 576. Melanosis.

This constitutes, properly speaking, the disease known by the name of encysted ovarian dropsy.

The first degree of this disease seems to be the presence of one or more small serous cysts, with transparent parietes, full of a fluid resembling water. These cysts, without changing their nature, may increase in size, so as eventually to occupy half, three-fourths, or even the whole of the organ. In this state, the ovary often assumes the appearance of a single simple or multilocular sac filled with limpid serum.

These, however, are not the only description of cysts found in the ovaries; there are others whose parietes are of a quite different texture, being formed sometimes of fibrous, cartilaginous, or osseous tissue, and sometimes in a great measure of encephaloid. These parietes may become so very thick, and the cavity of the sac so large, as to form a tumour occupying the whole of the abdomen, thrusting back the intestines, and reaching to the spleen, liver, and diaphragm. Externally, it is generally knobbed and uneven, and here and there presents considerable dilatations and contractions. In some parts of it we can discover a distinct fluctuation, while in others it is as hard and dense as a stone. In one case that came under my observation, the upper part of one of these tumours, which was situated in the left hypochondrium, formed a

large fluctuating sac, separated by a hard and narrow neck from the rest of the tumour situated in the right iliac region. During the life of the patient, it was supposed that there were two distinct and independent tumours in the abdomen, the nature of one of which was evident enough, while that of the other could not be determined, as it bore a much greater resemblance to a tumour of the spleen or of the left lobe of the liver, than to a portion of a tumour of the right ovary.

The cysts in the interior of these tumours are not all of equal size. In almost every case I had an opportunity of examining, there was one much larger than any of the rest, in the anterior portion of the tumour. I am not sure whether this is uniformly the case, or merely an accidental circumstance.

Whatever be the anatomical composition of the intermediate substance, the internal surface of the cysts is always lined with the same kind of membrane, which is smooth, thin, and more or less vascular; in short, possesses all the characters of a serous membrane. Yet, notwithstanding this identity of the lining membrane, each sac generally contains a different fluid, some of which are never found but in the ovaries. Pure serum, fluid or coagulated blood, pus, various fatty matters of different degrees of con-

sistence, and a variety of colouring matters, some of them bearing a strong resemblance to chocolate, are not unfrequently contained in the same ovary; and there is often but a slight partition between a cell full of pus or serum, and another containing a suety matter, or, perhaps, tufts of hair.

This last mentioned substance (hair) is sometimes found in encysted ovarian dropsy, but it is not in that affection that it occurs most frequently. There is a sort of sebaceous matter, which is invariably present either in the interior of the ovary, or on its external surface, whenever this morbid developement of hairs takes place. There is no other morbid alteration which invariably accompanies them; but, in many cases, teeth, fragments of bone, or rudiments of skin, are likewise found in these tumours.

The hairs found in this singular situation are sometimes scattered through the fatty matter above mentioned, and sometimes matted into a tuft. Their two extremities are generally alike, at least they were so in every case I had an opportunity of examining. Meckel, however, in his interesting memoir on the subject,* states that he has ascertained the fact of their

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* *Memoira sur les Poils et les Dents qui se developpent accidentellement dans le Corps*, par Fr. Meckel, in the *Journal Complementaire*, Nos. 14 *and* 15.

being furnished with bulbs, like the natural hairs. In my opinion, when they are found implanted in the fatty matter, and do not adhere to any membrane, they have then no bulb; but when, on the contrary, they are fixed in a membrane more or less analogous to the skin, it is natural to suppose they have one.   Their length varies from a few lines to upwards of a foot.   The longest I ever saw myself were about six inches.   In colour, they present every variety to be found in the hair of the head, to which they bear a greater resemblance than to that on any other part of the body; it is to be observed, however, that they do not always resemble the hair of the person in whom they are found, either in colour or in other particulars.   This is remarkably exemplified in the case of the negress described in my *Clinique Medicale*, who had a large cartilaginous cyst in her mesentery filled with a sebaceous matter in which were imbedded a number of these hairs differing altogether from the black woolly hair on her head, inasmuch as they were smooth, fine, and of a light or reddish colour. Besides, it is by no means unusual to find hairs of different colours in the same tumour.

The developement of teeth in the ovary is much more uncommon than that of hairs.   In almost every instance where they have been observed, they were implanted in fragments of

osseous or cartilaginous matter, which in some cases were merely amorphous masses, and in others appeared to be the remains or rudiments of maxillary bones, furnished with alveoli. Meckel is of opinion that these accidental teeth are formed, like the natural teeth, in capsules filled with a gelatinous fluid, and that their crowns are formed before their roots. He agrees, however, with Blumenbach, in opposition to Baillie, that the roots have been sometimes found perfectly developed.

The osseous substance occasionally found in the ovaries mixed with hairs or teeth, appears to be in many cases merely the *debris* of an extra-uterine fœtus, inasmuch as other pieces of the skeleton are also found; but in other cases it is impossible to trace any resemblance between these accidental formations and the natural structure of the fœtal skeleton.

It is an interesting question to decide whether the rudiments of skin that are sometimes found in the ovarian cysts are connected with the abortive formation of a fœtus. There is a case related by M. Reynaud in the *Journal Hebdomadaire de Médecine*, (tom. i. p. 475), which seems to throw some light upon this subject. No doubt, in certain cases, these fatty masses found in the ovary, containing hairs, teeth, bone, and skin, present several of the elements

of the body of a fœtus, arranged in their natural order.   But, this is not sufficient to prove that they are the rudiments of a fœtus.   For, similar masses have been found in girls who had not arrived at the period of puberty : they have also been found in other parts besides the ovary ; and, what affords a still stronger objection to the theory, they have been found likewise in the male subject. In some cases of gravel, published by Magendie, which I shall hereafter have occasion to cite, it appears that the kidneys actually secreted hairs ; thus proving that they can be produced in other parts as well as in the skin, even in the male.   Again, Ruysch states that he found in the stomach of an adult man an atheromatous tumour, which contained a shapeless bone, four molar teeth, and a tuft of hair.   Meckel mentions two cases of a similar nature.

In the 13th volume of the Medico-chirurgical Transactions, there is an account given by Dr. Gordon of a tumour which was situated in the thorax of a woman, and the contents of which bore a much greater resemblance to the *debris* of a fœtus than any of those above mentioned. If it were really such, it can only be accounted for by the theory of *monstrosity by inclusion*, so ably discussed by M. Ollivier in a memoir published in the *Archives de Medecine*.

CHAPTER IV.

Diseases of the Breasts.

THESE, though properly belonging to surgery, demand our attention here, in consequence of the light which many of them are capable of throwing on the nature of certain alterations of the internal organs, particularly scirrhus. The diseases of those organs may, I conceive, all be reduced to certain modifications in the nutrition of the various anatomical elements of the mammæ, or to morbid secretions developed in the cellular tissue which enters into their structure or invests their surface. These affections have almost all been confounded under the denomination of scirrhus or cancer of the breast.

I shall commence with those alterations that depend on a derangement of the nutrition of the part. The most simple of these is induration of the mammary gland. In this state, the tissue of the gland remains perfectly distinguishable, being merely altered in its density and hardness. The component cellular tissue is likewise unchanged. The induration may be either general or partial ; in the latter case, the indurated points may project more than the rest of the gland, and thus give it a knobbed appearance.

This affection is occasionally confined to the

walls of the lactiferous ducts, which are at the same time hypertrophied, and considerably dilated. This seems to occur mostly in elderly women. It is a singular circumstance that, in all the cases of it I have seen, the nipple, so far from sharing in the hypertrophy, had disappeared, and the ducts were obliterated before they reached it.

The mammary gland, while becoming indurated, may at the same time diminish in size. Its natural anatomical elements then still remain, but its tissue becomes much more dense, compact, and dry, the fat completely disappearing, and the cellular tissue being scarcely perceptible. The dilatation and thickening of the lactiferous ducts described in the preceding paragraph, may be present in this case also.

Another kind of induration of the mammary gland is that in which the cellular tissue becomes greatly thickened, while the proper tissue of the gland is more or less wasted. In this case, the gland, when cut into, presents septa of a dead or silvery white colour, and fibro-cellular or even tendinous structure, which divide it into lobes, lobules, and grains, so as to make it resemble the tissue of the pancreas or of a salivary gland. As the disease advances, this granulated appearance vanishes, all trace of glandular tissue is lost, and we find nothing but masses of a fibro-

cellular substance, or else a single, hard, homo-
geneous mass, without any apparent organiza-
tion, which appears to be cellular tissue at its
maximum of condensation, and it is termed
scirrhus. These various alterations may affect
the whole gland or only a part of it.

The diseased portion of the gland may either
be continuous with the sound parts, or com-
pletely separated from them by means of a fibro-
cellular envelope. The internal surface of the
envelope often sends forth processes, of the
same nature with itself, into the contained mor-
bid mass; in other cases, the only means of
a connexion between them are a few soft cellu-
lar filaments, so that the tumour can easily be
extracted from its investing membrane, like the
kernel of a nut from its shell. When the whole
gland is indurated, it is sometimes in like man-
ner surrounded by an envelope of condensed and
hardened cellular membrane, particularly when
it is at the same time diminished in bulk. In
other cases, however, instead of being thus iso-
lated, it contracts adhesions much closer than
ordinary, either with the parts beneath it, or
with the skin. In such cases, the alteration is
not confined to the cellular tissue of the gland
itself, but extends to that of the neighbouring
parts, which then becomes in like manner trans-
formed into hard masses of a fibrous, cartilagin-

ous, or scirrhous appearance. This alteration may extend to the cellular tissue of the axilla, and even to the surface of the bones. The periosteum is then often affected, and the bone itself becomes diseased in consequence, and is ultimately destroyed by necrosis. While this change is going on in the deep seated parts, the superficial do not escape, and sooner or later the skin becomes involved in the affection of its subjacent cellular tissue. This, however, seldom happens until the cellular tissue subjacent to it has become so diseased that it can no longer be moved over the tumour, but feels as if incorporated with it. About this period, there often appear on the surface of the tumour numbers of hard round pimples, which evidently result from a circumscribed induration of so many portions of the cutis vera, which is probably of the same character, and produced by the same cause, as that of the subjacent tissues ; and it is very remarkable, that the skin of the whole body is sometimes in a very short space of time covered with similar hard nodules, which are also found in many of the internal organs. In several instances, the developement of these nodules can be distinctly traced to the period of the removal of the tumour from the breast, thus establishing the fact of a general or constitutional cause producing similar effects all

over the body. As soon as the skin immediately over the tumour has contracted adhesions with it, so as to be no longer moveable, it becomes irritated, red, softened, and ulcerated in one or more points, which subsequently unite in one large ulcer. In some cases this ulcer remains a long time stationary ; in others, it extends rapidly, either superficially, or both in surface and depth. For an account of the various appearances assumed by these ulcers, and of the effects they produce, I must refer the reader to works on surgery, where he will find them fully detailed. When we consider that these ulcers are formed over parts whose organization is already seriously altered, and has a constant tendency to become still more so, it will be easy to conceive why they cannot possibly have any disposition to heal ; for, before that could take place, the deep seated disease should first be healed. Accordingly, if by any chance some of these ulcers do cicatrize, they either open again, or fresh ones break out beside them. It is true that, in a few instances, a durable cicatrization has been effected, but then the tumours beneath underwent a spontaneous modification, having shrunk and contracted so as to form only a small hard mass, isolated from the surrounding parts by a cellulo-fibrous envelope. It appears that one of the best results of the system of

compression so frequently employed by M. Re-
camier in his treatment of cancerous diseases,
is the production of this modification and isola-
tion of the tumour, in which he has been some-
times so successful as to be able to extract it
with his fingers after making an incision into
the skin above it.

While the skin thus softens and ulcerates, or
even before that period, the scirrhous mass be-
neath undergoes a remarkable change. It is
traversed by a number of blood-vessels, which
ramify chiefly on the septa that divide its inte-
rior into lobules ; it next gradually loses its ori-
ginal hardness, and becomes infiltrated with se-
rous, gelatinous, bloody, or purulent fluids, and
at last becomes a mass of half solid half fluid
matter, in which may be observed every variety
of accidental production from pus to tubercle,
encephaloid, or melanosis, all blended together.

In the various forms of alteration hitherto
described, the blood vessels do not make their
appearance for a considerable time after the
commencement of the scirrhous tumour. There
is, however, another morbid state of the breast,
in which they are the principal part of the dis-
ease, being considerably augmented in size, and
developed in amazing numbers ; the cellular
tissue likewise vegetates at the same time, but
seems to do so merely in order to support the

immense vascular net-work which of itself con-
stitutes the greater part of the tumour, and,
when cut into, bears some resemblance to the
interior of the spleen. The skin over the tu-
mour thus formed ulcerates, and copious hæ-
morrhages constantly issue from the bottom of
the ulcer. I lately saw a remarkable case of
this kind in a man of about sixty years of age :
the tumour, which was as large as a child's head,
occupied the right side of the thorax ; it was
soft, painful, and bled profusely on the slightest
touch. The man told me he had been bitten
by a horse in the right nipple some years pre-
viously, and that soon after a red spot appeared
on the part where he had received the bite,
which gradually became prominent, and was at
last transformed into this enormous tumour.
This man was accompanied by a son, who had
a small reddish excrescence, possessing all the
characters of the erectile tissue, on his cheek,
where he had received a slight blow eighteen
months before.

Lastly, there are some tumours of the breast
which originate in its lymphatics. This morbid
alteration is characterized by some of the lym-
phatic ganglions which are scattered through
the substance of the gland becoming enlarged
and indurated ; at the same time they present
a red colour, or in some instances a grey trans-

parent appearance. At first, the parts around appear perfectly healthy ; but subsequently these ganglions increase in size and number, the surrounding cellular tissue participates in the alteration, and at last the disease assumes the same characters as those already described in the preceding paragraphs.

The several alterations of the breasts we have hitherto considered originated in the lesions of nutrition, and were only complicated with lesions of secretion towards their termination ; but we now come to a class of these diseases in which the lesions of secretion constitute the primary affection. These lesions are almost exclusively confined to the cellular tissue.

Inflammation of the mammæ, whether acute or chronic, is often followed by the formation of pus; but the origin, nature, and symptoms of mammary abscesses have been so often and so fully described that I need not dwell upon them here. Another morbid production not unfrequently developed in the cellular tissue of the mammæ are cysts, which may contain either serum, gelatinous, colloid, or encephaloid matter, tuberculous matter, or hydatids.

I have now enumerated the various organic alterations that occur in the breasts. We must bear in mind, however, that these are all local effects, produced by a general cause, and conse-

quently that cancer of the breast is not to be re-
garded as a local lesion, but merely as a symp-
tom of a general *diathesis,* which preceded its
formation in that part, and may produce it in
many others : so that, when we remove the local
lesion, we in fact only destroy a symptom of the
disease, not the disease itself ; on the contrary,
we thereby render it in many cases more dan-
gerous and more speedily fatal.   How often do
we see the diathesis which had previously re-
mained latent, quickly manifest itself after the re-
moval of the diseased part, and cause a develope-
ment of cancerous tumours in other parts of the
body.   Were it necessary, I might adduce ano-
ther powerful argument in support of cancer
being a *constitutional,* not a *local* disease, in the
peculiar dingy tinge of countenance which inva-
riably accompanies it, and frequently affords the
experienced practitioner a more unerring diag-
nostic mark of the true nature of the disease,
than could be obtained from an examination of
the physical characters of the local affection
itself.

CHAPTER V.

Diseases of the Fœtus and its Appendages.

THE amnion sometimes exhales a much greater quantity of serum than ordinary, and thus produces a particular kind of dropsy, which is described in every work on midwifery. Serum may also accumulate in the delicate cellular tissue that unites the amnion and chorion ; blood has likewise been effused between these membranes. The amnion is also liable to inflammation, one of the effects of which is the formation of adhesions between the opposite surfaces of the membrane, which, according to M. St. Hilaire, is the cause of certain malformations of the fœtus.

The placenta, besides occasionally contracting preternatural adhesions with the uterus, being situated on the cervix uteri, and deviating from the natural form, is subject to most of the lesions of nutrition and secretion observed in other organs. Thus it is sometimes found in a state of hypertrophy, and, according to M. Desormeaux,* one of the varieties of the mola carnosa of authors consists in this affection of

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* *Dictionnaire de Medecine*, par MM. Adelon, Andral, Beclard, &c., art. *Œuf.*

the placenta. In other cases, it is remarkably small, and withered, in short, is reduced to a perfect state of atrophy, the consequence of which is an arrest of the developement, and sometimes even the death, of the fœtus. Pus and other morbid secretions, such as osseous and calcareous concretions, have occasionally been observed in the placenta.

Amongst the morbid productions that are sometimes developed on the uterine surface of the placenta, and apparently in the place of a fœtus, must be reckoned the mass of vesicles already alluded to as occurring in clusters like grapes. Some authors have imagined that these can only arise from the dilatation of the superficial vessels of the placenta; and the natural disposition of those vessels affords some support to the opinion. In the work already cited, there is an accurate description of them, to which I refer the reader.

The diseases of the embryo and fœtus are numerous, consisting of most of those that have been observed after birth, together with numbers that occur exclusively during the period of intra-uterine existence, namely, the various congenital malformations. The latter have been already fully described. Many of the former, also, have been mentioned in various parts of this work; so that I shall merely give a general sketch of them here.

The alimentary canal is often found more or less injected in stillborn infants ; but the causes that may produce this during delivery are so numerous, that it is not of itself sufficient to prove that there has been a process of irritation in the intestines before birth. In other cases, it is perceptibly softened, and its internal surface remarkably pale ; which, in my opinion, is a much more certain indication of disease than the former. In an infant that came into the world in an emaciated state, and died in six days after birth, M. Billard found in the duodenum a vegetation of the mucous membrane, which had evidently grown there before birth. In another infant that was also but six days old, he discovered a scirrhous induration of the submucous cellular tissue of the intestine, which in like manner must have taken place before birth. In children that died on the second or third day after birth, he found Peyer's glands red and tumid, some of the isolated follicles in an incipient state of ulceration, and circumscribed red patches on the intestinal mucous membrane.

The circulatory apparatus also of the fœtus occasionally presents some remarkable lesions. It is a fact that one would never imagine *a priori*, that irritation of the pericardium, terminating in the formation of false membranes or purulent effusion into its cavity, is a common

enough disease in the fœtus, even more so per-
haps than in the adult.   In one of the cases of
this affection observed by M. Billard, the two
folds of the pericardium were united by very
strong adhesions, so that the disease must have
occurred long before birth.   The same author
once found in an infant only two days old con-
siderable dilatation of the right cavities of the
heart, together with extreme attenuation of
their parietes ; and in another of the same age,
an aneurism of the ductus arteriosus.   Lastly,
the blood itself of the fœtus is sometimes altered
in its physical properties, and becomes trans-
formed into a fluid like chocolate.

The respiratory apparatus is subject to some
very serious lesions in the fœtus.   The lungs
have often been found hepatized in infants that
were stillborn, or that died in a few hours after
birth : I have seen two cases of it myself.   In
another case, I met with numerous abscesses in
one lung.   Tubercles, as I have already men-
tioned, are very rare in the fœtal lung.   In the
pleura, there have been found false membranes,
and effusions of serum, blood, or pus.

The following apparatuses of secretion are
occasionally found diseased in the fœtus.

1. The cellular tissue.   The alteration of
this tissue has already been described. (*Œdema
sive induratio telæ cellulosæ neonatorum.   Anglice,*
Skinbound.)

2. The serous membranes. I have just described the alterations occasionally observed in the pericardium and pleura of the fœtus : the peritoneum is also subject to the same affections. I found all the intestines soldered together by firm cellular adhesions in an infant two days old.

3. The liver. Hyperæmia of this organ, with or without effusion of blood, is a common affection in the fœtus. Tubercles have also occasionally been found in it.

4. The kidneys. These have been often found transformed into large sacs containing a serous or purulent fluid ; an alteration which, in the fœtus, is generally connected with a perfect or imperfect obliteration of the uterus or urethra. Hoffman relates a case of a calculous concretion being found in the bladder of a female infant three weeks old, whose mother presented all the symptoms of a calculus in the kidney.

The principal diseases of the cerebro-spinal apparatus in the fœtus that have been hitherto described are, various degrees of active and passive hyperæmia, effusions of blood in or around the nervous centres, softening of their substance, sometimes attended with a remarkable smell of sulphuretted hydrogen, collections of pus in the brain, an accumulation of serum in the ven-

tricles, and various malformations depending mostly on an arrest of developement.

The integuments of the fœtus may present several morbid conditions resembling those observed in the same parts after birth; such as small pox, measles, pemphigus, syphilitic ulcers, &c. Dislocations and fractures, too, have been occasionally observed in the fœtus, but their cause is still unknown. Lastly, the thymus and the supra-renal capsules have been sometimes found in a state of suppuration. This long list of diseases to which the fœtus is subject affords abundant proof that the different alterations to which our organs are liable, may arise spontaneously, or at least independently of any external influence.

The fœtus is occasionally developed elsewhere than in the cavity of the uterus; and the pregnancy is then said to be extra-uterine. Of this there are four kinds, according as it takes place in the cavity of the peritoneum, in the ovary, in one of the fallopian tubes, or in the substance of the walls of the uterus. The three first have long been known; the fourth has been lately described in a memoir by M. Breschet, in the first volume of the *Repertoire d' Anatomie ;* and we have at present nine well authenticated cases of it on record.

When the embryo is developed in the perito-

neum, it is always contained in a cyst. When in the ovary, that organ is transformed into a vast sac. When in the fallopian tube, the portion which contains it is considerably dilated, while the rest of the tube retains its usual form and dimensions. Lastly, when the pregnancy occurs in the substance of the walls of the uterus, the embryo is contained in a sac situated at either angle, near the insertion of the corresponding fallopian tube, and formed of the proper tissue of the organ more or less modified. Of the nine cases of this description which have been observed, six occurred at the left side and three only at the right. The sac in which the fœtus is contained has no communication whatever either with the cavity of the uterus or with the adjacent fallopian tube, the uterine orifice of which is invariably obliterated. The latter circumstance throws considerable light on the way in which this variety of extra-uterine conception takes place.

The embryos that are developed either in the substance of the walls of the uterus, or in the fallopian tube, never come to their full time. In a few months after conception the investing sac bursts, and they fall into the cavity of the peritoneum, where they almost in every instance produce a fatal inflammation.

In the two other kinds of extra-uterine preg-

nancy, the fœtus may come to its full time, and the mother then begins to experience all the symptoms that usually precede delivery. In some cases, death occurs during the progress of these symptoms; in others, they disappear, the fœtus dies, and may continue for an indefinite period in the abdomen of the mother, without producing any unpleasant effects; lastly, in others, after a longer or shorter period, fragments of the fœtus are expelled by the rectum, or by a fistulous aperture formed spontaneously in some part of the abdominal parietes: death sometimes occurs during this process of expulsion, while, in other instances, a perfect recovery ensues.

The fœtus undergoes very remarkable changes during this protracted residence in the ovary or peritoneum. In some cases the skeleton alone continues to be developed, and, on opening the body of the mother, is found as completely formed as in a fully formed infant; the bones, however, are remarkably small, and are crowded together without preserving their natural relative situations. In other cases we find only some fragments of the skeleton, together with teeth, pieces of skin, and hairs, all impacted in a fatty substance; and, in others again, we find a cyst containing a perfect and fully formed fœtus. A very remarkable case of this descrip-

tion is recorded in an American Journal for
May, 1828.   The subject of it carried in her ab-
domen for forty years a full grown, well formed
fœtus, which during that long period had not
undergone any considerable alteration except
the ossification of a great portion of the integu-
ments.   The walls of the cyst in which it was
contained were likewise ossified.   There was
no trace of an umbilical cord or placenta to be
discovered.

In all cases of extra-uterine pregnancy, the
uterus undergoes some of the changes which
usually take place in it when it contains the
embryo : thus, it increases in size, its tissue as-
sumes a muscular appearance, and a decidua is
formed on its internal surface.   The breasts,
too, become tumid, and milk is secreted as
usual.

APPARATUS OF INNERVATION.

If the variety of the functional derangements of an organ bore any constant proportion to that of its derangements of texture, no part should present a greater variety of lesions than the nervous centres and the nerves : such, however, is not the fact ; these lesions are few in number, and frequently bear no proportion to the nature or intensity of the symptoms ; nay, it sometimes happens that we cannot discover any lesion whatever in the nervous system, although its functions have been seriously deranged during life. It is, however, highly probable that some organic lesions do exist in such cases, though they escape our notice ; and as there are few functional disorders of the brain or other parts of the nervous system which may not thus occur without any appreciable lesion, it follows that, when we do find an alteration of structure in those parts, we ought to be cautious how we attribute the functional derangement to it, inasmuch as such alteration is often purely accidental, secondary, or consecutive, and the derangement of function depends on some other lesion

which altogether escapes our notice. What strengthens this view of the subject is, that we find that a lesion which produces certain symptoms in one case, does not produce any symptom at all in another; and that the same lesion may be accompanied by the most dissimilar symptoms, and the most dissimilar lesions by the same symptoms.

Accordingly, notwithstanding the ingenious researches which have lately been made in this department of pathology, we must for the present observe considerable caution and reserve in our attempts to explain the derangements of the functions of the nervous system observed during life, by the nature of the organic lesion found after death. Neither can we come to any more positive conclusion from the situation of the lesion; for, morbid anatomy has but rarely confirmed the conclusions relative to the functions of the various parts of the nervous system drawn from experimental physiology, or comparative anatomy; while, on the contrary, it has often invalidated them.

SECTION I.

DISEASES OF THE BRAIN AND SPINAL CORD.

CHAPTER I.

Lesions of Circulation.

ARTICLE I.

HYPERÆMIA.

THERE are two degrees of hyperæmia of the nerves and nervous centres : in the first, the capillaries are simply distended ; in the second, the blood is effused into the nervous substance.

§ I. *Hyperæmia without Effusion of Blood.*

It is not always easy to detect the existence of this kind of hyperæmia, owing to the variations in the natural degree of vascularity according

to the part examined, the age of the subject, the nature of the disease, and the kind of death. To these, therefore, we must first direct our attention.*

If we examine the two component substances of the nervous centres, we find them presenting different shades of colour in different parts, according to the number and size of the vessels of those parts.   For instance, the grey substance of the cerebral hemispheres generally appears more strongly injected in the depressions than in the convolutions, and in both it is in general much less vascular than the white substance, or at least its vessels are much less apparent.

In young people and adults the colour of the cortical substance of the cerebral hemispheres resembles that of weak coffee mixed with a great deal of milk.   Its surface is found sprinkled over with red dots arising from the rupture of the meningo-cephalic vessels, and its interior is traversed by some small vessels.   In elderly people, this substance becomes paler and more of an ashy colour ; and in very advanced age, it acquires a slight yellowish tint, which, however, sometimes appears prematurely at a much earlier period.   It is composed of three distinct layers,

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* Cazauvieilh, *Recherches anatomico-physiologiques sur l'encephale, con-sidéré chez l'adolescent, l'adulte, et le viellard.*

which may be easily discovered by making a horizontal section through one of the convolutions. The first is of a whitish grey ; the second, which is very thin, of a dirty white ; and the third, which is the thickest, of a leaden grey ; it is in this layer that the vessels are generally most apparent. M. Cazauvieilh states that the middle layer is not equally visible in all brains, nor in all the convolutions of the same brain : and it is hard to say what effect its greater or less developement may have as well in the healthy, as in the diseased state.

The white substance of the cerebral hemispheres is of a milk white colour in young people and adults ; after the fiftieth year, it gradually becomes of a deader white ; and, in old age, it assumes a slight yellowish tint, like the cortical substance. It contains more vessels in children than in adults, and in adults than in old people ; whence it follows, that when we find the brain of an old person as vascular as that of a child, it is to be considered in a morbid state.

In the *thalami optici*, the external layer ought to be of a purer white than that of the white substance of the hemispheres ; and some small vessels may appear on its surface without constituting a morbid state. The internal grey substance is pale, and in some points rose-coloured, in young people ; later in life, it be-

comes of a deeper grey, and in old persons assumes a slight yellowish tinge.

In the *corpora striata* the external grey substance is naturally of a deeper colour than the grey substance of the *thalami optici*. It contains some small rose-coloured patches, and a few red points, and is traversed by vessels of considerable size. The white substance is less vascular than the grey : they both acquire a yellowish tint in old age.

The *corpus callosum* is of a somewhat less pure white than the medullary substance of the hemispheres, and generally contains very little blood.

The *fornix* has scarcely any vascularity whatever, and accordingly ought to be of a uniform white colour. The same is the case with the *corpora mamillaria*, and with the white envelope of the *cornua Ammonis*.

The interior of the *cerebellum* is of a reddish grey colour, which perhaps depends on the dependent position in which it generally lies. Its white substance is generally traversed by fewer vessels than that of the cerebral hemispheres. However, it is common enough to see large vessels in the neighbourhood of the *corpus rhomboideum*.

The *tuber annulare* is generally dotted with red points, which are less numerous and smaller

than those found in the hemispheres. The white substance of which it consists is mixed with another substance, of a pale, dark, or yellowish grey, according to the age of the subject.

The *tubercula quadrigemina* are of a less pure white than the other parts of the brain composed externally of the medullary substance; the grey substance in their interior presents a reddish tint.

The *pituitary gland* is usually reddish, especially in its anterior portion. I have sometimes found effused in it a matter resembling the lees of wine, in persons who had never presented any symptoms of a cerebral affection; but I do not know whether it is a morbid condition of the part or not.

The white substance of the spinal cord is usually of a beautiful milk white colour, and contains but few red points. The grey central substance is often slightly reddish.

In persons that die of acute disease, the different parts of the cerebro-spinal axis are more injected than in those who die of chronic affections. The injection is also much greater where the patient has died in a state of asphyxia.

Lastly, after death, there are two causes which may produce a considerable redness in the mass of the encephalon. One of these is the prolonged exposure of the brain to the air,

after stripping it of its membranes, or cutting some slices from its substance ; the other is the dependent position in which the cranium may happen to lie, which produces the hypostatic hyperæmia already frequently alluded to.

We now come to the proper subject of this article, namely, the hyperæmia of the nervous substance produced by disease. This substance then presents various forms and shades of colour.

The most common is the red colour, of which there are two kinds, the dotted and the uniform.

The dotted redness is particularly remarkable in the medullary substance, where it is merely a morbidly increased degree of the natural dotting of the part. The appearance of the brain in this species of redness has been compared by M. Lallemand to that of a white surface sprinkled over with red sand, and accordingly he has given it the name of " *injection sablée*." It may be general or partial, and frequently appears strongly marked around effusions of blood. When very intense, it gives the part a rose-coloured tinge, and then approaches closely to the uniform redness. After all, this kind of redness can only be considered as decidedly the result of active hyperæmia of the brain, when it is very well marked ; and even then we must always allow for the kind of death the person has suffered.

The uniform redness is much less frequently the anatomical sign of active hyperæmia of the brain. It is never general, and may exist in either of the two substances. It is seldom observed in the white, and when it does occur there, it is mostly in the neighbourhood of an effusion of blood, though it may also exist in it without there having been any hæmorrhage. The white substance then presents sometimes a light rose-coloured, and sometimes a deep red tint, which occasionally bears an exact resemblance to the colour of mahogany. It may also appear in the grey substance, which then assumes a reddish or scarlet tinge. This redness in its various degrees has been seen, 1. in the grey substance of the convolutions, either involving them all, or confined to some particular ones; 2. in the grey substance scattered through the various parts of the cerebro-spinal mass.

This uniform redness of the cerebral substance assumes so many different shades that it has been described as purple, violet coloured, of the colour of lees of wine, of chocolate, or of mahogany. In other cases it becomes brown or greenish, and, lastly, in others, certain parts of the brain, especially around apoplectic effusions, have been found tinged with various shades of yellow. But, as we often observe this yellow

DISEASES OF THE BRAIN

colour passing insensibly into various shades of
red, we must conclude that the former results
from sanguineous injection as well as the latter.
In fact, all that is requisite to form any of the
shades above described, is a change in the pro-
portion of the colouring matter of the blood.

We have already seen, in other tissues, the
red tinge produced by acute irritation passing,
from various causes, into a brown or slate co-
loured tint : the same occurs sometimes in the
brain also. M. Billard observed this slate co-
loured tint in the cortical substance of the cere-
bral hemispheres in two individuals who had
presented all the signs of chronic irritation of
the brain. In a third, in whom he also observed
it, death occurred in three days after a fall upon
the head. It was a child of twenty-two months
old, whose leg was broken by the wheel of a
coach : there was at first violent fever and great
restlessness, and then profound coma terminat-
ing in death. On dissection, the cerebral hemis-
pheres were found in a remarkable state of tur-
gescence, and their cortical substance was of a
slate coloured tint, quite different from its natu-
ral grey colour. Before the accident, the child
had never shown the least symptom of func-
tional derangement of the brain.*

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* *Archives de Médecine,* vol. ix. p. 492.

This slate coloured tint, instead of spreading uniformly over the whole of the cortical substance of the hemispheres, may be confined to a few points in it. M. Billard found, in front of an old apoplectic cicatrice situated in the corpus striatum, a slate coloured spot, which commenced at the anterior portion of the centrum ovale, and extended to the surface of the anterior lobe, its depth of tint increasing all the while. The corresponding portion of the cortical substance was somewhat red and depressed for an extent of about half an inch.*

Hyperæmia of the nervous centres without effusion of blood appears at all ages, but is particularly frequent at birth and in old age. At the first mentioned period, it results from the great quantity of blood received by the brain in the numberless vessels with which it is then furnished. In old age, the brain receives much less blood than in infancy, but then it is often sent there in a violent or irregular manner, and by jerks as it were, in consequence of the hypertrophy of the heart so frequent at that age. Besides, the arteries have generally lost some of their elasticity, so that the distribution of the blood is unequal, and performed with difficulty; and the flaccidity of the veins retards its return.

* *Ibidem.*

Hyperæmia of the brain, at whatever period of life it appears, may occur in three different ways : 1. it may acquire its highest degree of intensity quite suddenly, and produce symptoms of apoplexy terminating rapidly in death ; 2. there may be several sudden attacks of it, in the intervals of which the health is unaltered, until at last it returns with more violence, and death ensues ; 3. it gradually attains to a certain degree of intensity, and then presents symptoms of encephalitis instead of those of apoplexy.*

Hyperæmia of the nervous centres often produces the same symptoms as are ordinarily referred to hæmorrhage or ramollissement. In some cases it accompanies the latter ; and, in others, appears to be the prelude to, and accompaniment of, the former. Lastly, it often accompanies an increase of density of the substance of the brain.

In most cases of hyperæmia of the brain, the investing membranes, especially the pia mater, are also congested. In some instances, there is an effusion of a turbid or a limpid serum into the ventricles, or into the subarachnoid cellular tissue of the convexity of the hemispheres. In others, on the contrary, the different external or internal surfaces of the encephalic mass are de-

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* Bouillaud, *Traité sur l'encephalite.*

prived of their natural humidity, and the arach-
noid in particular is remarkably dry.

§ II. *Hyperæmia with Effusion of Blood.*

There are few parts of the nervous centres in
which effusions of blood have not been observed.
They may be divided into three classes, accord-
ing as they occur on the external surface of the
nervous centres, in their cavities, or in their
substance.

Those of the first class are of two kinds : in
the one, a small quantity of blood is effused be-
neath the pia mater, in one or two of the an-
fractuosities ; in the other, the blood is effused
in a uniform layer extending sometimes over
the whole of a cerebral hemisphere, and
sometimes around the spinal cord. This hap-
pens frequently in new-born infants, but is un-
usual at other periods of life.

Those of the second class are scarcely more
common than the preceding. We certainly
often find blood effused in the ventricles in cases
of apoplexy, but such effusion is almost always
the result of the rupture of their parietes, where-
by a communication was established between
them and the accidental cavity formed by the
blood in the substance of the brain.

In fact, it is there that the hæmorrhage most

frequently occurs : in 392cases of cerebral hæmorrhage I have found described in authors, the seat of it was in some part of the substance of the brain in so many as 386, in 202 of which it occurred in the part of the cerebral hemispheres on a level with the *corpora striata* and *thalami optici*, as well as in those parts themselves.

The size of the cavities formed by the effused blood is very variable, some being scarcely as large as a pea, and others occupying almost a whole hemisphere. When a considerable effusion takes place in one of the hemispheres, it generally ruptures the walls of the lateral ventricles ; the septum lucidum, also, is often torn, the fornix destroyed, and their place occupied by large coagula of blood. In other cases, the effusion makes its way to the exterior of the brain, and the blood then spreads over the cavity of the arachnoid.

The number of these cavities is equally variable, there being sometimes but one, sometimes two, and sometimes a great many. When there are many in the same brain, they are seldom found all in the same state, but generally appear to have been formed at different periods; and if we then inquire into the history of the case, we find that the person has had several attacks of apoplexy before the last fatal one. Effusion frequently takes place in some part of

the cerebral hemispheres without occurring else-
where ; whereas it seldom occurs in the cere-
bellum without appearing in the cerebrum also.

It appears from the researches of M. Ro-
choux and others, that cerebral hæmorrhage
seldom occurs till after fifty, and is most com-
mon between the ages of sixty and seventy.
However, cases of it have been observed at all
ages. M. Billard * mentions one where it oc-
curred three days after birth ; and M. Serres,
another, in a child three months old.† M.
Guersent also saw a case of its occurrence at a
very early age.‡ I saw an instance of it myself
in a boy of twelve.

The effused blood varies greatly in appear-
ance according to the time elapsed after its effu-
sion. At first it resembles thin currant jelly,
and some of it still remains fluid. Somewhat
later, twelve or fifteen days after the attack, for
instance, the coagulum is found to be firmer
and more circumscribed ; later still, it becomes
white or yellow, and is surrounded by a brown-
ish red fluid. The walls of the containing ca-
vity are smooth, and lined with a delicate mem-
brane. The surrounding cerebral substance in

* *Traité des Maladies des Enfans*, p. 600.
† *Dictionnaire de Médecine*, par MM. Adelon, Andral, Beclard, &c.
article *Apoplexie*. ‡ *Ibid.*

some cases retains its natural appearance, and in others is altered both in colour and consistence, becoming rose-coloured, red, brown, or yellow, and at the same time softer or more firm than usual.

As the interval between the effusion and the examination increases, the coagula gradually disappear, and in their place we find either a small cavity lined with a yellowish membrane like a serous membrane, and containing a serous or gelatinous fluid; or a similar cavity containing a set of filaments parallel or intersecting, so as to form a kind of network not unlike cellular tissue, infiltrated with serum; or, lastly, a straight or puckered cicatrice produced by the approximation and adhesion of the parietes of the cavity : as to the time required for the formation of this cicatrice, we cannot fix any certain rule. It has been stated that it takes a much longer time to form when the effusion has occurred transversely to the cerebral fibres, than when it has occurred in a parallel line to them.

I have now described the most usual mode of termination of cerebral hæmorrhage in those cases where the patient recovers ; but I have reason to think that in some instances the coagulum, instead of being absorbed, may become organized, and thus form a sort of accidental

tissue nourished by the arteries of the surrounding cerebral substance. The following case, at least, appears strongly confirmative of such an opinion. In a man who died at *La Charité*, after having been for several years in a state of hemiplegia, resulting from an attack of apoplexy, I found in one of the cerebral hemispheres a mass of a pale red colour, and fibrinous appearance, which was traversed by small vessels anastomosing with those of the brain : the surrounding portion of the nervous substance was natural, and the mass was not encysted.

Anatomists had long remarked that the nervous pulp is very often softened around apoplectic effusions ; and used to attribute this to the effusion, considering it as merely a secondary lesion : but M. Lallemand has clearly proved that the ramollissement, far from being always subsequent to the effusion, often precedes it, and is one of its causes. In fact, it is possible to follow in a softened portion of the brain all the degrees between simple injection and sanguineous effusion. When the ramollissement does occur subsequently to the effusion, it is not the mechanical result of the maceration of the part by the blood, except in some few cases where the hæmorrhage is very considerable ; but is rather produced by a process of irritation

like that set up around every foreign body. As the effusion becomes absorbed, and the cavity that contained it advances towards cicatrization, the surrounding nervous substance ceases to be injected, and regains its former consistence; sometimes, indeed, it even acquires an unusual degree of hardness.

In a great many cases of hæmorrhage in the brain or spinal cord, there is no trace of alteration discoverable in the vessels of the part; so that the hæmorrhage must have arisen from exudation, or from the rupture of the capillaries. It often happens, too, that, though we cannot discover, any more than in the preceding cases, the ruptured vessel from which the hæmorrhage proceeded, we yet find the whole of the circulatory system of the encephalon in an unnatural condition, most of the arteries being transformed into osseous canals, whose parietes, being incrusted with phosphate of lime, have lost their elasticity, and may be broken with the greatest ease by a slight pull, or by moderate distention. This state of the cerebral arteries is very common in old people, and we know that they are most subject to apoplexy.

Lastly, in a few cases, the vessel from which the hæmorrhage took place has been discovered, situated either on the walls of the cavity formed by the effused blood, or at some distance from

that cavity.   As to the effusions that take place on the external surface of the nervous centres, some proceed also from the capillaries, and others are owing to the rupture of some of the large vessels on the exterior of the brain or spinal cord.   Thus, M. Serres* saw an attack of apoplexy result from the perforation of the basilar artery, which presented, near its superior bifurcation, an aneurismal sac large enough to contain a hen egg.   In another fatal case of apoplexy observed by the same author, the effusion was produced by the perforation of the anterior communicating artery of the brain.

It has been asserted that hypertrophy of the heart is frequently observed in apoplectic patients, and that it is one of the causes of the hæmorrhage.   For my own part, I have observed this coincidence sufficiently often to have reason to believe the truth of the assertion.   We know, too, that some of the effects of cerebral congestion, such as flushing of the face, giddiness, &c., are generally enumerated among the symptoms of hypertrophy of the heart.   However, it appears from the researches of M. Rostan that affections of the heart are by no means so frequent in persons that die of apoplexy, so far as his own experience goes ; and M. Rochoux found

* _Archives de Médecine_, Vol. x. p. 119.

only three cases of aneurism of the heart among forty-two apoplectic individuals whose bodies he examined. I am inclined to think that we ought not to adopt the conclusion of M. Rochoux without examining more minutely into the state of the case. At the period at which he made his researches, the term aneurism of the heart was applied only to those lesions of that organ in which its volume was increased. Now, this is not the lesion of the heart that occurs most frequently in apoplectic persons; it is that species of hypertrophy of the organ in which the thickness of its parietes is increased at the expense of its cavity, while the bulk of the heart itself remains unaltered. Therefore, unless M. Rochoux assures us that he comprehended this kind of hypertrophy under the term aneurism of the heart, his researches on the subject cannot be depended on.

ARTICLE II.

ANÆMIA.

ANÆMIA of the nervous centres is produced under the influence of the same causes as have been already assigned to anæmia in general. The affection may be confined to the brain, or

may extend over the whole body. It is ob-
served both in chronic and in certain acute
diseases, in which, though the symptoms seemed
to announce a state of irritation of the brain,
that organ is found remarkably pale. As I have
already insisted upon this topic, it is sufficient
at present to remind the reader of the fact.
However, I cannot help citing the following re-
markable case, as an instance of how the depriv-
ing the brain of its accustomed stimuli may pro-
duce precisely the same effects as would arise
from increasing them.

A man greatly addicted to drunkenness was
thrown into prison for robbery, and obliged to
live upon bread and water. He had not long
continued this new course of life when his intel-
lects were observed to be disturbed, and he be-
came pale, weak, and emaciated, and unable to
sleep at night. Delirium at last supervened, at
first gentle, but afterwards perfectly frantic.
The medical attendant, having been informed
of his previous habits of life, suspected that the
symptoms were owing to the sudden and total
abstinence from spirituous liquors ; and conse-
quently ordered him a small quantity of brandy
twice a day. Under this treatment the cerebral
symptoms soon disappeared, the patient gradu-
ally recovered his flesh and his strength, and
was eventually restored to his former health,

which he maintained during the remainder of his imprisonment.

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CHAPTER II.

Lesions of Nutrition.

THE nutrition of the nervous centres varies greatly according to the nature, and still more, according to the age of each individual; and hence arise modifications in their form, bulk, and consistence, with which it is necessary to be well acquainted, in order not to refer them to disease.

The cerebral hemispheres are by no means constantly symmetrical, their corresponding convolutions being often dissimilar both in size and form. This does not produce any appreciable functional derangement.

Every one knows that the size of the brain varies according to the individual. Considered in the same person at different ages, it continues to increase in size from birth up to manhood, and then remains stationary till old age, when it generally becomes somewhat diminished both in bulk and specific gravity. The same may be said of the spinal cord.*

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Cazauvicilh, *op. cit. Anatomie des systèmes nerveux des animaux à*

The convolutions of the cerebral hemispheres are but little developed till towards the end of the first year after birth : in old age they begin to decrease anew both in length and thickness. They vary greatly in different individuals in both particulars, as also in number. It is to be observed, too, that the largest brains have not always the most strongly marked convolutions.

The *thalami optici, corpora striata, corpus callosum,* and *mesocephalon,* all decrease in length in old age ; the diameter of the cerebellum remains unaltered.

It appears from the researches of M. Desmoulins that the bulk and specific gravity of the nervous centres undergoes no diminution in chronic diseases, however great the degree of general marasmus may be. Accordingly, in chronic diseases attended with considerable emaciation, a period arrives when the mass of the nervous system becomes too great in proportion to that of the others ; and hence, perhaps, arises that state of inordinate nervous excitability so common at a certain stage of those diseases.

Having thus considered the natural variations of the nutrition of the nervous centres, let us now proceed to the lesions of that function that are to be observed in them.

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vertebres, par Desmoulins, vol. II, p. 620. Ollivier, *Traité de la moelle épiniere,* vol. II, p. 720.

ARTICLE I.

HYPERTROPHY OF THE NERVOUS CENTRES.

WE must take care not to confound this with the apparent enlargement produced whenever there is any considerable degree of hyperæmia of the part, as that depends on the increased quantity of blood, and not on a real increase of the nervous substance itself.

Hypertrophy of the brain appears to have been known by Morgagni, and has also been described by Laennec,* who mentions his having found it in different subjects whom he had previously supposed to be affected with hydrocephalus internus. It has occasionally been found, too, in epileptic children, and in others that had died in convulsions.

The anatomical characters of this affection are the following :* the convolutions of the brain are crowded together and flattened, the intervals between them disappear, and it seems as if the immediate investing membranes of the brain had become too tight for it. The substance of the organ is firm, contains but little blood, and appears remarkably dry when cut

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* *Journal de Corvisart, &c.* vol. II. 669.

† *Repertoire d'Anatomie, &c.* vol. v.

into. The ventricles are, as it were, effaced, and the various surfaces of the brain deprived of their ordinary moisture. In other respects its texture remains unaltered. The affection generally involves both hemispheres, but is sometimes partial : thus, I saw a case where the left thalamus opticus was one-fourth larger than the right, which was of the natural size. There had not been any particular symptom observed during life that could lead to a suspicion of such a state of the parts.

No instance of hypertrophy of the cerebellum has hitherto been published, but the spinal cord has occasionally been observed in a state of hypertrophy, as well throughout its whole extent, as in some one part only. The affection is announced by the enlargement and increased firmness of the cord, without the presence of hyperæmia. The cord then fills the whole cavity of the dura mater, and is closely applied to the parietes of the vertebral canal. Laennec observed this hypertrophy throughout the whole extent of the cord. Dr. Hutin mentions a case in which it existed from the occipital foramen to the middle of the dorsal region; and I found it myself in the cervical region in a child that was subject to epilepsy.

I must give the same caution with respect to the spinal cord as I did with respect to the brain,

namely, to take care not to confound its enlargement from hyperæmia with that arising from hypertrophy. Perhaps I ought to refer to hypertrophy some cases mentioned by M. Ollivier, in which the cord presented an evident bulbous swelling immediately above the point where it had been subject to strong compression.

Hypertrophy of the nervous centres often exists without any appreciable enlargement of their osseous envelope. In some cases, however, the enlargement of the brain is carried to such an extent, that the skull also becomes enlarged. In a case of this description recorded in the seventh volume of the *Archives de Médecine*, the subject, a child of five years of age, had a head as large as that of a stout man ; and the parietes of the cranium varied from a line and a half to two lines in thickness. It was chiefly the hemispheres that were enlarged. There had not been any peculiarity observed in its intellectual faculties ; and its death was owing, not to the cerebral affection, but to an accidental attack of gastro-intestinal irritation.

In studying the alterations of other organs, we have often met with cases in which the proper tissue of the organ was in a state of hypertrophy : similar cases have been observed in the nervous centres. I once found one of the thalami optici and the neighbouring parts trans-

formed into a cellulo-vascular substance not un-like the tissue of the spleen, in which there was no trace of nervous substance to be discovered. The case published in the *Philosophical Trans-actions of the Royal Society of London*, for the year 1825, under the title of *Fungus hæmatodes of the Brain*, appears to me to have been much of the same description ; for it is stated in it that the *thalami optici* were converted into a *fungous tissue*, and that, internally, they resembled a mass of coagulated blood, like that found in the spleen. In like manner, the case mentioned in Magen-die's *Journal de Physiologie*, relative to a fun-gous mass found on part of the anterior face of the spinal cord of a woman, is, in my opinion, to be referred to hypertrophy of the cellulo-vascular tissue of the part.

ARTICLE II.

ATROPHY OF THE NERVOUS CENTRES.

OF this there are several degrees, from a slight diminution of the nervous centres, either throughout, or in some of their parts, to the to-tal absence of those centres.*

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* Vide *Archives de Médecine*, vol. XIV.

Atrophy does not occur with equal frequency in all parts of the cerebro-spinal axis : we may lay it down as a general rule that it is most frequently observed in those parts which are the last to attain their perfect developement. Thus, the spinal cord is formed before the brain, and atrophy of the former is much more uncommon than that of the latter. Again, the convolutions of the brain, which are the last parts developed, are the most frequently found in a state of atrophy.

Let us now proceed to consider the various degrees of this affection, as well as the parts where it has been chiefly observed.

The cerebral hemispheres have been more frequently found in a state of atrophy than any other part of the nervous centres ; and the affection may be either partial, or general. Partial atrophy of the hemispheres may affect :—

1. The convolutions. In some cases these are only smaller and less numerous than usual, either on both sides, on one side only, or in some parts of one side ; in others, they are totally absent, as was observed in the brain of an idiot, of between five and six years of age, presented by M. Jadelot to the *Academie Royale de Medecine.*

2. The whole superior part, from the external surface to the roof of the ventricles, which of

course then lie immediately under the meninges ; except when, as sometimes happens, we find in its place a serous sac, which has no communication with the ventricles. Sometimes the atrophy is not considerable, and we merely find one hemisphere smaller than the other, or even one lobe, only, either smaller or altogether absent.

3. The *thalami optici*, and the *corpora striata*. The atrophy sometimes affects particularly the grey substance of these parts, and sometimes the white ; which may produce a difference in the symptoms observed. Instead of being merely diminished, these parts may be completely absent, and be then replaced or not by a serous cyst.

4. The white central parts of the brain. These may be imperfectly developed in cases where there is no alteration in the hemispheres. Reil found the corpus callosum completely deficient in an idiotic female of the age of thirty. The cerebral hemispheres communicated only by the anterior and posterior commissures.

It is a remarkable fact, that when the cerebral lobes are absent, we sometimes find in the anterior part of the cranium two small masses of nervous substance, from whence the olfactory nerves arise. These are evidently the olfactory lobes, which thus display in man, in the morbid state, that independent existence which, in animals, is evident in the natural state.

One or both of the lateral lobes of the cerebellum have been occasionally found in a state of atrophy. M. Hutin mentions a case in which the medullary centre of the cerebellum was about one-third smaller than usual.

The hemispheres of the cerebellum, instead of being simply diminished, may present nothing but a cavity whose walls consist of a delicate lamina attached to the *corpora restiformia*, of which it appears to be an expansion. In such cases, the median lobe of the cerebellum, (inferior vermiform process,) and the *tuber annulare*, are also deficient, leaving the *crura cerebri* exposed to view. The *tubercula quadrigemina* may be present, even when the cerebellum is almost totally deficient.

The pineal gland is occasionally so diminished as almost to vanish. It was once found in an idiot transformed into a small granule scarcely the size of a grain of millet. Its variations in bulk do not necessarily involve any derangement in the nutrition of the other parts of the brain.

We have now seen that the various masses of nervous matter may diminish or even disappear altogether, leaving nothing but the medulla oblongata. Let us next turn our attention to the vertebral canal, and we shall find that the spinal cord may exist whether the brain be present or not, but that no part of the latter is ever

found in the absence of the former. Thus, pathological anatomy concurs with comparative anatomy and embryology in proving the dependence of the developement of the brain on that of the spinal cord.

We have many cases to prove that the spinal cord may be completely absent : when that happens, the cavities usually occupied by the nervous centres contain a fluid, and their walls consist of membranes resembling the meninges, in which the nerves terminate. It may also present various malformations, of which some resemble the different stages through which it passes in its progress to the perfect state, and all depend on an arrest or retrogradation of developement.

Thus, the two cords of which it is composed at an early period of its formation may remain separate on account of the non-deposition of the grey substance in the intervening space : this malformation is always accompanied by anencephalia. When these two cords do unite, they form a channel, and, subsequently, a canal, which continues permanent in many animals, but in the human subject is generally obliterated at the period of birth. It may, however, persist, and we then find a cavity in the centre of the medulla spinalis, the existence of which seems connected with the absence of the central grey

substance.   In some cases it is accompanied by other malformations, such as anencephalia, or *spina bifida ;* in others, not.   It always commences at the superior extremity of the spinal cord, where it appears to form a continuation of the fourth ventricle ; and may extend as far as the commencement or middle of the dorsal region, but not much lower.   It is sometimes barely large enough to admit a fine probe, while in other cases a goose quill could readily be introduced into it.   It has been found in subjects of all ages.

It has been asserted by some anatomists, that, besides the central canal, there are naturally two lateral ones in the spinal cord ; this, however, is not the case, but they are sometimes found as a morbid condition either reaching through the whole extent of the cord, or only as far as the cervical portion.

Another kind of atrophy of the spinal cord is where it is diminished in size.   This may be either general or partial.   M. Ollivier saw two cases of atrophy of the cord throughout its whole extent ; in one it was reduced to half, and in another to two-thirds of its natural bulk.   Magendie mentions another, where it was accompanied by induration.

The cranium generally indicates, by its malformation, the various degrees of atrophy of the

brain. However, I once saw a case where in the place of the upper part of the cerebral hemispheres there was a sac full of serous fluid, and yet the cranium was perfectly well formed. Similar cases have been observed by others.*

The nerves terminating in the atrophied parts of the cerebro-spinal axis do not always present the same appearance. Those of the spinal cord are sometimes as large as usual, and may even be found attached to its membranes in cases of its total absence; sometimes, on the contrary, they partake in its atrophy, either at their origin only, or throughout their whole extent.

In cases of partial atrophy, the parts of the body that receive nervous influence from the affected portions of the brain are themselves often in a state of atrophy. Thus, in almost all cases of atrophy of one of the cerebral hemispheres, the members of the opposite side are found less developed than ordinary; this, however, may result from the complete state of repose in which they remain.

Atrophy of the nervous centres cannot be referred to the influence of any single cause in particular.

1. It may occur without any known cause,

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* Dictionnaire de Médecine, art. Hydrocephalie.

either before or after their perfect developement.

2. It may occur subsequently to a process of irritation in the part. Thus, in persons who at a distant period before death had presented all the symptoms of cerebral hæmorrhage, it is not uncommon to find some part of the brain, particularly the *corpora striata* or *thalami optici*, singularly diminished in size, and transformed into a kind of serous cavity.

3. It may be produced by mechanical compression. Thus, tumours in the interior of the cranium, have sometimes caused the disappearance, or at least a considerable diminution, of the convolutions with which they happened to be in contact ; and one of the effects of caries of the vertebræ is to cause the atrophy of the portion of spinal cord compressed by the displaced vertebræ.

4. Lastly, the want of exercise of the functions of the nervous centres may produce in them a diminution of nutrition, and thus prove a cause of atrophy. We know that when a muscle is not exercised, it wastes away in like manner. Hence it follows that the atrophy of the brain generally observed in idiots, instead of being the cause of their disorder, may perhaps be only an effect of it.

ARTICLE III.

* RAMOLLISSEMENT OF THE NERVOUS CENTRES.

This name is applied to a peculiar morbid state of the nervous centres, in which they present an evident diminution of consistence, which is sometimes carried so far as to amount almost or altogether to liquefaction. Of course, the naturally soft state of the brain at birth does not come under this denomination ; nor yet the diminished consistence of that organ that is usually observed in persons who die of chronic disease. We must recollect, too, that all the parts of the cerebro-spinal axis are not naturally of the same degree of consistence; and that the interval elapsed after death, and the manner of opening the head or vertebral canal, may produce alterations in that consistence which would mislead us if we were not on our guard against those various sources of error.

Ramollissement of the nervous centres presents several degrees. In the first, the change of consistence is perceptible only to the touch. In the second, the nervous substance is so difflu-

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* I have been induced to use this word instead of *softening,* as I perceive it has been adopted by most English authors, though I cannot but think our own term equally expressive. T.

ent that the change is perceptible to the eye. In the third, it is completely fluid, its texture being totally destroyed, and nothing appearing in its place but a kind of cellular structure which appears to be the original framework of the part. Lastly, in the fourth degree, even this trace of structure disappears, and there is a complete solution of continuity.

The affected nervous substance may either preserve its natural colour, assume a new one, or be totally deprived of all colour whatever.

The natural colour is preserved chiefly in those cases where the ramollissement is situated in the medullary substance. The preternatural colours assumed are principally the following, of which there are numberless shades running into one another: rose red, purple, brown, violet, yellow, greenish yellow, light grey, and deep grey.

The softened parts occasionally contain effused blood, or pus, either infiltrating them or collected into a body. M. Lallemand imagines that in every case of white ramollissement, the white colour results from purulent infiltration. I cannot agree with him in this, for, in many cases of the kind there is nothing like pus to be seen. Sometimes, also, the softened portion has a smell of sulphuretted hydrogen.

There is no one part of the nervous centres in which ramollissement has not been observed:

however, the parts where it is most frequently found are also those in which hæmorrhage is most common, namely, the *thalami optici, corpora striata*, and the surrounding parts. It occurs much more frequently in the grey substance than in the white.

In the cerebral hemispheres, the ramollissement may affect :—

1. The cortical substance of the convolutions, the white substance beneath remaining untouched. This partial ramollissement deserves the more attention, as it readily escapes discovery when one is not previously aware of the possibility of its existence. It frequently accompanies active hyperæmia of the meninges.

2. A more or less extensive portion of the mass situated above the lateral ventricles. The affection sometimes occurs only in a few small isolated points, and yet the symptoms may be as severe as if the whole lobe were softened. When the ramollissement takes place near the surface of the hemisphere, its convolutions often become shapeless and flattened, and sometimes even present a kind of fluctuation.

3. The parietes of the lateral ventricles. I have sometimes found a softened and diffluent layer of nervous substance extended over these parietes, while the cavity contained a turbid fluid.

4. The *thalami optici.* In these, the affection sometimes attacks exclusively their external white layer, and sometimes their internal grey substance.

5. The *corpora striata.*

6. The parts on a level with, and external to, the two preceding.

7. The *cornu Ammonis* and Hippocampus minor.

8. The *corpus callosum, fornix, and septum lucidum.*

Softening of the other parts of the cerebro-spinal axis is less frequent than that of the brain properly so called. However, it has been observed in the mesocephalon, in the various portions of the cerebellum, and in the spinal cord.

The spinal cord has been sometimes found softened throughout its whole extent; but in general it is only so in some one part. Moreover, the two substances that enter into its composition may each be softened separately. When it is the internal grey substance that is affected with ramollissement, its liquefaction may produce accidental canals in the interior of the cord, which of course occupy the situation and present the form of that substance. M. Reynaud and I dissected two spinal cords that had such canals.

Ramollissement of the nervous centres may exist in one single point, or in several points at once. When in the hemispheres, it may affect corresponding parts in each ; and, lastly, it may occur simultaneously or successively in the brain properly so called, and in the other parts of the cerebro-spinal axis. General ramollissement is exceedingly rare in adults, but occurs sometimes in new-born infants. In thirty cases of pultaceous ramollissement of the brain observed by M. Billard, there were ten in which the affection extended to the whole of the spinal cord also ; and in each of those ten cases the odour of sulphuretted hydrogen was perceptible. The infants in whom this alteration was observed lived for some days after birth, but their respiration was laborious and imperfect, their limbs were flaccid and motionless, and the pulsations of the heart scarcely perceptible.

Ramollissement of the nervous centres occurs at all ages, but is most frequent in old people, and, next to them, in adults. Between fifteen and twenty it is rather uncommon, but becomes less so between two and fifteen years of age. Lastly, it appears from the labours of M. Billard that it may occur immediately after birth, and that it is then more considerable and more extensive than at any other period of life. Indeed, it is probable that in some cases it begins even before birth.

What is the nature, and what are the causes of this affection ? According to M. Lallemand, in his celebrated work on the subject, it is the constant and necessary result of an acute or chronic irritation of the parts ; and he has skilfully pointed out the various degrees of this irritation, from simple injection, to ramollissement, and purulent infiltration, and lastly, to the formation of collections of pus. But, this theory is not applicable to every case ; and I am inclined to agree with M. Rostan that there are many which have nothing at all to do with irritation. We often meet with cases where there is no appearance of sanguineous congestion, nor yet of purulent infiltration, or of any morbid secretion, a simple diminution of consistence being all that is to be seen. Neither can we demonstrate the necessary previous existence of irritation by the nature of the symptoms ; for we have often found that identity of functional derangements is no proof of the identity of the lesions that produce them. In fact, in the present state of our knowledge on the subject, it would be almost impossible, without having recourse to mere hypothesis, to assign the cause of ramollissement of the nervous centres in those cases in which it does not seem to have been preceded by irritation. The opinion of M. Rostan, that it is something of the same nature with *gangrena*

senilis, is merely conjectural, though it might be supported, at least, as well as the other.

ARTICLE IV.

INDURATION OF THE NERVOUS CENTRES.

THE consistence of the nervous centres is sometimes remarkably increased, either throughout their whole extent, or only in some particular parts.

There are various degrees of this increase of consistence. In the first degree, the affected part presents the consistence of a brain that has been kept for some time immersed in diluted nitric acid ; in the second, it is as firm as wax ; and in the third, it is as firm and elastic as fibrocartilage.

In the first degree, the nervous substance may contain little or no blood, and is of a remarkable silvery whiteness.

I have already said that the induration may be either general or partial. When general, it it has never been observed to exceed the first degree. The whole brain is then remarkably firm, but not equally so throughout, the white substance being in general harder than the grey, especially in the central parts of the brain, as well as at the origin of the various nerves. In some cases the hyperæmia shows itself only in

some points of the brain, while the parts in which it does not appear are, notwithstanding, almost equally firm.

General induration of the brain has been principally observed in persons that had presented all the symptoms of ataxic fever. I also found it in two individuals who had been in the habit of handling lead, and who died in a state of general convulsion.

The spinal cord may also become indurated throughout its whole extent. M. Billard once found this carried to such a degree in a new-born infant, that the cord, after being stripped of its membranes, was able to support nearly a pound weight : the infant had had convulsions in its limbs, and the meninges were lined with thick false membranes. Induration of the spinal cord, like that of the brain, affects principally the white substance, the grey being generally exempt from it.

Partial induration of the nervous centres is most frequently found in the second and third degree, and is, moreover, a chronic affection, whereas general induration seems to be most frequently an acute one. It has been observed in various parts of the nervous centres, and, among the rest, in the cerebral convolutions. When the affection is at all considerable, the grey substance disappears, or at least is scarcely to be distinguished from the white. However, in a case

mentioned by M. Lallemand, the induration existed solely in the cortical substance of a few of the convolutions, and the white substance beneath was softened.

Induration of the centre of the medullary substance of the cerebral hemispheres was observed by M. Pinel in a woman who died in a state of insanity ; the posterior and inferior margin of the cerebellum was also so indurated as to become almost fibro-cartilaginous. M. Payen once found, in a girl six years old, a depression in the posterior third of the left cerebral hemisphere, which was owing to the induration and shrinking of one of the convolutions. The superjacent membranes were thickened and white, and accurately defined the extent of the diseased part. The girl, who was of a melancholy temperament, but remarkably intelligent, had had from her birth a contraction of the right wrist and foot, together with slight atrophy and incomplete hemiplegia of the same side.

Partial induration often accompanies other alterations of the nervous centres : thus, the portions of nervous substance that form the walls of accidental cavities containing old effusions of blood, or certain morbid productions, are often found indurated.

The causes of induration of the nervous centres are still rather obscure. However, when we

consider that general induration in the first degree, as well of the brain as of the spinal cord, is usually accompanied during life by all the symptoms that characterize irritation of the nervous centres, and that, besides, we often find, after death, traces of irritation of the meninges, and injection of the nervous substance itself, we shall find reason to conclude that this kind of induration results also from irritation, or, if you will, from a degree of *encephalitis*.

As to partial induration, it may in some cases be, like the former, the result of irritation ; of which its existing around old effusions and several morbid productions, together with the thickened and infiltrated condition of the meninges near the indurated parts, may be adduced as proofs. But still, we must bear in mind that, in the greater number of the cases of partial induration hitherto observed, the antecedent existence of induration is merely hypothetical; so that we must wait for farther information before we can venture to decide positively on the subject. M. Lallemand has suggested that, in some cases, partial induration of the brain ought to be considered as a mode of recovery from ramollissement ; but this also requires confirmation.

ARTICLE V.

ULCERATION OF THE NERVOUS CENTRES.

I do not mean to speak here of the consecutive ulceration, that occurs after cerebral hæmorrhage, ramollissement, &c.; but of that which is unaccompanied by any other alteration. We occasionally find, either on the external surface of the cerebral hemispheres, or on that of the *corpora striata* and *thalami optici*, some points in which the nervous substance is superficially eroded, so as to form ulcers of various sizes and forms. We must be on our guard against mistaking for these ulcers the solutions of continuity that are sometimes so readily produced in the cortical substance of the convolutions, when in a state of ramollissement, by detaching the pia mater.

There are some interesting cases of ulceration of the brain recorded in the seventh volume of the *Archives de Medecine*. One of them is relative to a soldier twenty-four years of age, who died with all the symptoms of irritation of the alimentary canal and of the brain. At the commencement of his disease, he had been attacked with an exceedingly severe pain about the orbits, which continued to the last, and used

to cause him frequently to scream with agony. On opening the body, there was found on the inferior part of the anterior lobe of one of the cerebral hemispheres an ulcer thirteen lines in length and seven in breadth, and of a yellowish appearance ; its surface was hard and dry, and its edges were uneven and ragged. The subjacent cerebral substance was sound, as was also the rest of the brain ; but the arachnoid was strongly injected throughout, and the part of it corresponding to the ulcer was destroyed. In another case, there had not been any pain in the head, and the death of the patient was caused by a gastro-intestinal irritation, which at the latter end of the disease produced delirium. There were two small ulcers found on one of the posterior lobes of the brain, involving only the grey substance. The surrounding portion of the brain was injected.

CHAPTER III.

Lesions of Secretion.

THE morbid secretions found in the nervous centres occur in three different forms :—

1. In intimate combination with the nervous tissue.

2. Contained in an accidental cavity whose parietes are formed by the nervous substance itself, the surrounding portion at the same time generally presenting different alterations.

3. Contained in an accidental cavity whose parietes are constituted by one or more accidental membranes, the surrounding nervous substance being at the same time in general sound.

The accidental membranes that form the parietes of the cysts in the third form are of various kinds. The tissues of which they are composed are the vascular, the cellular, the serous, a celulo-vascular tissue which generally resembles mucous tissue, the fibrous, the cartilaginous and the osseous. These may exist either single or combined in the one cyst, and the period at which this cyst is completely formed is often also the period at which the morbid productions cease to announce their presence by any particular symptoms; which evidently arises from the circumstance that the previously diseased surrounding nervous substance then becomes healthy again. Hence it follows, that the severity and nature of the symptoms produced by the developement of any morbid production in the nervous centres, depend less on the mere existence of that production, than on the condition of the surrounding nervous substance.

ARTICLE I.

EXHALATION OF SERUM IN OR AROUND THE NERVOUS CENTRES.

I HAVE already repeatedly had occasion to allude to the ingenious researches of M. Magendie with respect to the cerebro-spinal fluid. An acquaintance with the nature and seat of this fluid, and with its variations as to quantity, quality, and situation, may lead us to the discovery of so many important pathological facts, that I consider it indispensably necessary to give some account of it. Before Magendie had directed the attention of physiologists to the existence of this fluid, and had determined its functions, who would have thought that the most serious consequences may result merely from an increase or diminution in its quantity? Such, however, is actually the case. Its removal immediately produces in an animal a singular state of dulness and stupor, from which it does not recover until a fresh supply has been secreted, which is not till after some days: the older the animal the more marked the symptoms. In one case, however, the same operation produced in the animal a kind of maniacal fury, which resembled madness, but certainly was not hydrophobia.

The artificial accumulation of this fluid in the vertebral canal sometimes causes paralysis.

In the human subject, the cerebro-spinal fluid usually amounts to about two ounces. It is probable that its diminution produces a great many nervous affections which could not before this be accounted for by the discovery of any appreciable lesion in the nervous centres, or else were referred to alterations that were not their true cause. Its increase is the cause of certain cases of serous effusion in the substance or in the ventricles of the nervous centres ; for, M. Magendie has ascertained the existence of a natural communication between the subarachnoid spinal cavity, where the fluid in question is principally situated, and the fourth ventricle, from which it readily passes into the other ventricles. This communication exists opposite the end of the fourth ventricle, at the part known by the name of the *calamus scriptorius :* the aperture which forms it is circular, and is two or three lines in diameter ; it may be discovered between the two posterior arteries of the cerebellum. In several cases of serous effusion into the ventricles, M. Magendie found both this aperture and the *fissura Sylvii* perceptibly enlarged. He is of opinion that the quantity of the fluid cannot much exceed two ounces without producing some bad effects.

Collections of serum may be formed either

in the substance of the nervous centres, or in
their investing membranes. In the former case,
the serum may infiltrate the nervous substance,
or may be contained in a cavity. M. Guersent
has described a peculiar state of the brain in
children, in which various parts of it are so
much infiltrated with serum as to be quite soft-
ened. The affection is most frequently observed
in the white central parts that connect the two
cerebral hemispheres ; but it also occurs occa-
sionally in some of the neighbouring parts. In
the greater number of cases of it observed by
M. Guersent, there was also a considerable ef-
fusion of serum in the ventricles ; however, it is
sometimes found without any such effusion,
which proves that it is not the mere mechanical
result of the maceration of the cerebral sub-
stance by the effused fluid. I have often ob-
served a similar state of œdema of the brain in
adults, but have never found it attended by any
particular symptom : M. Guersent makes the
same remark with respect to its occurrence in
children.*

The serum that is found collected in acci-
dental cavities formed in the nervous substance,
is in general effused there subsequently to cer-
tain lesions already described, to an effusion of

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* *Dictionnaire de Medecine,* tom. II; p. 310.

blood, for instance. A membrane becomes organized around the coagulum, and afterwards furnishes the serum. In other cases, we find a vast cyst filled with serum, supplying the place of an atrophied portion of the brain.

The serum effused on the various surfaces of the nervous centres may be situated, 1. between the dura mater and the parietes of the cranium ; 2. between the arachnoid and the dura mater ; 3. in the great cavity of the arachnoid around the encephalon ; 4. in the subarachnoid cellular tissue (pia mater) ; 5. in the different ventricles, and even in the cavity between the two folds of the *septum lucidum.* M. Breschet has in more than one instance discovered a genuine dropsy of this fifth ventricle, in children from six to twelve months old.*

The quantity of serum effused in these situations varies from a few drachms to several pints. It is never very considerable when the effusion is the result of an acute affection. As long as the effusion is not very copious, the cavities of the brain are not much distended, and its substance, though it may be more or less compressed, remains entire. But, when it is so considerable as to tend to fill of itself the whole of the cavity of the cranium, the cerebral sub-

* *Dictionnaire de Medecine, art. Hydrocephale chronique.*

stance first loses its form, and at last disappears.
In some cases, the mass of the hemispheres is
reduced to a delicate lamina, like that of which
it consisted in the early period of fœtal life.   In
others, there is not even a vestige of the part to
be found, and the whole of the brain above the
ventricles is transformed into a serous sac, the
walls of which consist of the meninges.   Lastly,
in other cases, the destruction of the brain is
still deeper ; but these fall under the cases of
anencephalia, of which I have already treated.

While the serum thus tends to occupy the
place of the nervous substance in the interior
of the cranium, the latter generally becomes
enlarged : indeed every one must be familiar
with the appearance of hydrocephalous patients.
In some cases, however, the head retains its na-
tural dimensions ; and in others, far from being
enlarged, it evidently becomes smaller than na-
tural.   The bones of which the cranial parietes
are composed are often found in the natural
condition ; in other cases, they are exceedingly
thin, and are separated from each other by large
cartilaginous intervals ; lastly, in others, they
grow excessively thick. We see, then, that there
is no constant relation, either with respect to
form or to nutrition, between the state of the
brain and that of its osseous envelope.

That kind of effusion of serum that is not

sufficiently copious to produce any deformity in the brain, may occur at any period of life, either as an acute or as a chronic disease. It often co-exists with different lesions of the brain or its membranes, that are perceptible in the dead body; and it may, in certain cases, be considered to arise from them. The lesions that generally precede or accompany it are, injection of the nervous substance or of its investing membranes, ramollissement, an old or recent apoplectic co-agulum, or an accidental production developed in the cerebral parenchyma. Sometimes, how-ever, we cannot find any thing in the brain or its appendages except a great quantity of limpid serum. We must take care not to mistake for the effect of disease the small quantity of seros-ity that is usually found accumulated in the ce-rebral ventricles.

The effusion may take place in a few hours; and we have then the not very common dis-ease known by the name of *serous apoplexy*. It generally, however, takes a few days to form; and we then observe that assemblage of symp-toms that has been described by the name of *acute hydrocephalus*. It is as yet by no means well determined how far the effusion is con-cerned in the production of these symptoms; as it often appears unattended by them, or, indeed, by any other cerebral symptoms, while, on the

other hand, we as frequently observe those symptoms in cases where, after death, there is not any effusion worth mentioning to be found either in the ventricles or elsewhere. Some writers have of late described, under the name of chronic hydrocephalus of the old, a disease characterized by the gradual weakness of the various cerebral functions, in which, as they assert, there is nothing to be found on examination after death, but a considerable accumulation of serum either in the subarachnoid cellular tissue of the external surface of the brain, or in the ventricles.

The effusion that is so copious as to deform or destroy the surface of the brain, is generally a congenital affection, though it has sometimes been known to occur after birth. Little is known as to the causes that give rise to it ; and though in some cases it has appeared to succeed an irritation of the brain or its membranes, we must allow that in most instances we are totally ignorant of its source. It leaves the question where it found it to say that there is, in such cases, a co-existence between the arrest of developement of the brain, and an unusually copious exhalation from its investing membranes; for we are still in the dark as to which of the two lesions is the primary one.

The accumulation of serous fluid in the

membranes or in the substance of the spinal cord, has been denominated *hydrorachis.* In this disease, the fluid is sometimes merely effused either in the arachnoid or between it and the pia mater ; and sometimes occupies the place of the cord itself, which is then imperfectly developed.

There are two kinds of hydrorachis, the accidental and the congenital, each of which comprises two varieties, according as the vertebræ are divided or not. Division of the vertebræ is most common in cases of congenital hydrorachis, but has also occasionally been observed in cases of accidental hydrorachis in adults ; it is well known by the name of *spina bifida*, and by some authors is termed *tumor lumbaris*, from its being generally situated in the lumbar region. The most frequent cause of this disease appears to be an arrest of developement of the osseous parietes of the vertebral canal, connected either with dropsy of the investing membranes of the spinal cord, or with an arrest of developement of the latter also, in consequence of which it remains in its original fluid state. In those rare cases where *spina bifida* has been ob-

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* This term is more correct than *hydrorachitis*, being composed of ἰδωρ aqua, and ραχις, spina, and being therefore analogous to *hydrocephalus, hydrometra.*

served in adults, we must suppose either a secondary alteration of nutrition in the vertebræ, or a process of absorption whereby they are brought back to the primitive state of developement.

Spina bifida is characterized externally by the presence of one or more tumours situated on the vertebral column. In the greater number of cases, they are situated on the lumbar vertebræ, but also occur pretty often in the sacrum, more rarely on the back, and more so still towards the neck. Their magnitude is very variable : some are scarcely as large as a nut ; indeed, properly speaking, there is sometimes no tumour at all, but merely a slight projection of the skin, which is transparent, and conveys a sense of fluctuation ; others, again, are as large as an infant's head ; while, in some cases, the tumour is more remarkable for its great extent, than for its bulk in any one point. For instance, when the spinal canal is open posteriorly through its whole extent, we observe the skin or other membranes forming a uniform or uneven projection along the middle of the back. Their form is equally variable with their situation and magnitude. Some are globular, others, elongated or oval ; sometimes they are largest at their base, and sometimes they are attached only by a narrow pedicle. The last

case occurs chiefly when the opening in the vertebræ is very small. When there are seve-ral tumours, by pressing on one, we generally increase the size of the others, which proves that they communicate freely. In general, too, the seat of the tumour being in the lumbar re-gion, its bulk increases when the patient is in an upright position.

The parietes of the tumour have not always the same anatomical composition. In some cases they are formed, proceeding from without inwards, 1. by the skin, which may be perfectly sound, thickened, attenuated, ulcerated, almost gangrenous, or covered with fungous growths or tufts of hair; 2. by the membranes of the spinal cord. In other cases, the skin is defi-cient, and then the membranes of the cord, which alone form the parietes of the tumour, are either nearly in the natural state, or else red, congested, and thickened.

The fluid contained in the tumour may oc-cupy various situations: it has been found, 1. in the cavity of the arachnoid; 2. between the arachnoid and the dura mater; 3. between the arachnoid and the pia mater; 4. between the latter membrane and the osseous parietes of the spinal canal; 5. in a canal formed in the midst of the spinal cord, (Brunner, Otto, Portal, Mec-kel); 6. in a cyst situated outside the dura ma-

ter, which latter, as well as the other membranes, was perfectly free from alteration. (Lechel). According to various authors, its quantity may vary from a few ounces to six or seven pints. Lastly, as to its nature, it has been found as clear as spring water, slightly turbid, flocculent, sanguineous, and puriform. The analyses that have been made of it in cases where it appeared to be merely composed of serum, prove that, like the fluid of hydrocephalus, it contains a less proportion of albumen than the fluid of other dropsical effusions.

The state of the vertebræ forms a very important subject of consideration, both with respect to the number divided, and to the degree of division of each in particular. With respect to the first, spina bifida has been divided into the complete and the incomplete. It is said to be complete, when the whole of the posterior part of the vertebral column is cleft, as well as the sacrum and coccyx. This degree is very rare; but the division is not unfrequently found almost complete, extending, for instance, from the first to the last vertebra, or from the last cervical vertebræ to the commencement of the sacrum, &c. It is said to be incomplete, when the division exists only in a circumscribed part of the spine; accordingly, it has been divided into cervical, dorsal, lumbar, sacral, and coccygean spina bifida.

In each of these regions, the division may exist in but one vertebra, or may extend to several. Spina bifida of the lumbar vertebræ is by far the most common ; the next in point of frequency is that of the back, then of the neck, and last of the sacrum. As to the division of the coccyx alone, there is but one case on record.

Whatever be the number of vertebræ divided, the division may present various degrees, which have been reduced by Fleischmann to three principal ones.

FIRST DEGREE. *All the elements of the verte-bræ present, but its two lateral arches not united.* Ruysch mentions a case of this description, in which the lateral arches of each of the three last lumbar vertebræ were separated from those of the opposite side by an interval three lines in width, so that the spinous processes appeared to be cleft longitudinally. This degree is but seldom observed.

SECOND DEGREE. *The two lateral arches im-perfectly developed.* In this, which is the most common of the three, the spinous process, the laminæ, and the articulating and transverse processes, successively disappear, so that the vertebra is at last reduced to its body.

THIRD DEGREE. *The body of the vertebra it-self divided into two parts.* Wepfer saw a case where the whole of the dorsal portion of the

spine was divided in this manner; and the same malformation has been observed in one or more of the lumbar vertebræ. This degree is more uncommon than either of the preceding.

It sometimes happens that the tumour, instead of arising from the division of one or more vertebræ, is produced by a kind of hernia of the membranes of the cord through an accidental interval between the last lumbar vertebra and the sacrum. (Mohrenheim, Portal.)

As to the spinal cord itself, in some cases of spina bifida it is sound, and in others altered; according to Meckel, the latter are the most common. Its deviations from the natural state relate to its situation, its structure, and its existence. Thus, as to the first, it is sometimes situated, not in the vertebral canal, but in the cavity of the tumour, especially when the latter is in the lumbar region: of course the natural position of the spinal nerves is then greatly altered. With respect to its structure, it may be diminished in size, softened and reduced to a pulp, more firm than usual, surrounded with hydatiform vesicles, closely attached to its investing membranes, imperfectly divided into two parts, or spread out into a kind of membrane, &c. In general, these alterations exist only in the points corresponding to the division of the vertebræ. Lastly, some authors assert

that in certain cases of spina bifida there was no vestige of a spinal cord to be discovered. Meckel thinks that in these cases it must have been either softened and liquified, as already mentioned, or else must never have existed at all.

Congenital hydrorachis with division of the vertebræ may be unaccompanied by any other affection, or may be complicated, 1. with other affections of the nervous system, such as hydrocephalus, anencephalia, acephalia, &c. ; 2. with various malformations of the other organs, such as the absence of the front of the abdomen, extroversion of the bladder, hypospadias, imperforate anus, hare-lip, or general transposition of the viscera, &c.

ARTICLE II.

SECRETION OF PUS.

Pus is often found in the nervous centres ; indeed the brain, in particular, may be considered as one of the parenchymata in which it most frequently occurs.

It may be either infiltrated through the substance of the part, or collected in a cavity. Purulent infiltration of the nervous centres is generally accompanied by ramollissement ; how-

ever, I have already explained my reasons for
not assenting to the opinion of M. Lallemand that
every case of white ramollissement is owing to
suppuration.   It is easy to follow the transition
from mere infiltration of pus, to the formation
of collections of that fluid.   We first observe
small drops of it scattered in greater or less
numbers through a portion of the nervous sub-
stance, which is at the same time generally in-
jected and softened.   These drops gradually
multiply, extend, and run into one another; the
solid parts between them grow softer and softer,
and at last appear as it were dissolved in the
pus, leaving only a few filamentous fragments
behind.   We have then a cavity, which, how-
ever, does not become distinctly circumscribed till
some time afterwards.   When the parietes of this
cavity first become distinctly marked, they consist
merely of the nervous substance itself; but sub-
sequently we observe on their surface in succes-
sion, 1. a cellulo-vascular substance, either spread
uniformly over their whole extent, or existing
only in some isolated points ; 2. a real mem-
brane, which, however, is still soft, flocculent,
and separable from the nervous substance ; 3.
a membrane of more firm consistence, and dis-
tinct organization, which is sufficiently tenacious
to be detached either in shreds or in a single
piece from the subjacent tissue.   When this
membrane is thus far developed, it may assume

various appearances; being in some cases found to consist of several folds, each of which seems to constitute a distinct membrane, and, in others, having its internal surface covered with filaments which float loosely in water like villi. M. Lallemand, in his *Recherches Anatomico-pathologiques sur l' Encephale*, describes two cases of the former description.

The nervous substance around the abscess does not always present the same appearance, being generally, in a greater or less degree, in a state of hyperæmia and ramollissement, when the abscess is recent ; but often perfectly free from alteration, when the abscess is of long standing, and contained in a distinct membrane. In the latter case, abscesses of considerable size may exist in the brain, without producing any symptoms to betray the fact ; so that it is not until after death that we discover the existence of a morbid change in the organ. We shall see, farther on, that the same may happen with other morbid productions. However, after the nervous substance around an encysted abscess has continued for a long time sound, it may at last take on a state of irritation, hyperæmia, and ramollissement ; and we then observe various symptoms which cannot be attributed to the abscess itself, the nature of the cyst proving that it existed long before their appearance, so that we

can only refer them to the new process of irri-
tation set up around the abscess.

   The pus found in the nervous centres ex-
actly resembles that of the other parts of the
body, and is equally subject to variations in its
qualities, (colour, consistence, &c.,) which de-
pend as well on the state of the nervous sub-
stance, as on the general diathesis of the indivi-
dual.   It is sometimes remarkably fetid, which
proves the falsity of the opinion that pus never
becomes fetid except when in a situation where
the atmospheric air has access to it.   When
formed in the substance of the brain, it some-
times makes its way out of it ; thus, abscesses of
the cerebral hemispheres have been occasionally
observed to open into the ventricles.   In many
cases, at the same time that pus is poured out
near the surface of the brain, the neighbouring
bones become altered and destroyed ; and in
this way abscesses of the brain have been known
to empty themselves into the nasal fossæ, sub-
sequently to the destruction of the cribriform
plate of the ethmoid bone, and into the ear,
after the destruction of the petrous portion of
the temporal bone.   However, in the latter case,
the abscess of the brain is not always the primi-
tive lesion, but often results from a disease of
the organs of hearing, as has been clearly shown
by the works of MM. Itard and Lallemand.

Collections of pus are most frequently met with in the cerebral hemispheres, particularly in that portion of them situated above or on a level with the *centrum ovale*. They are also sometimes found in the cerebellum, as well as in the interior of the mesocephalon; lastly, in one solitary case, the tubercula quadrigemina and pineal gland were found totally destroyed, and their place occupied by an abscess.

As to the spinal cord, it is not uncommon to find it infiltrated with pus; but, as far as I am aware, it has never been found to contain an abscess.

ARTICLE III.

SECRETION OF TUBERCLE.

It appears from the works of MM. Gendrin, Léveillé, Ollivier, and others, that tubercles occur in the nervous centres much more frequently during childhood than at any other period of life, being seldom observed in very young infants, and still more seldom in adults. In adult phthisical patients, tubercles of the nervous centres are by no means common, even in those cases where they are found in many other organs besides the lungs. They occur much

more frequently in the hemispheres of the brain than in any other part of the nervous centres, occupying indifferently the cortical and the medullary substance, and sometimes appearing to be situated between the two. In some cases, although lodged in the cortical substance, they seem to have been originally formed in the pia mater, and to have made their way into the substance of the brain as they grew larger. In others, they appear to have been originally developed between two of the convolutions.

The parts where they have been oftenest found, after the hemispheres, are successively, the cerebellum, the mesocephalon, the medulla oblongata, various parts of the spinal cord (especially about the cervical region,) the crura cerebri, the crura cerebelli, the thalami optici, the corpora striata, the pituitary gland, and the commissure of the thalami optici. We may perceive from this, that the parts of the nervous centres most subject to hyperæmia, or to ramollissement, are not those most subject to tubercles.

Tubercles of the nervous centres are generally few in number in the same subject ; indeed it is not uncommon to find but a single one : in no case are there as many found in the brain as are usually met with in the lungs of phthisical patients. Their form resembles that of tuber-

cles of the other parts of the body; while their surface is sometimes uneven and knobbed, and they are divided into lobes separated by cellular septa. They are of all sizes from that of a grain of millet to that of a hen egg, or even larger. Cases have been observed, for instance, in which either the whole of the cerebellum, or one of its hemispheres, was occupied by a tuberculous mass, which left no trace of its proper substance.

These tubercles are not always in immediate contact with the nervous substance, being often separated from it by a membrane of variable organization, which envelopes them completely, and forms a genuine cyst. Bayle has described an instance of this, in which the cyst was found in the medulla oblongata. M. Gendrin maintains that all cerebral tubercles are encysted; and M. Léveillé is of the same opinion. The membrane of the cyst is sometimes remarkably thick, and assumes a fibrous, cartilaginous, or even osseous texture.

The nervous substance around the tubercles is often perfectly healthy; but sometimes presents various alterations, being found in a state of hyperæmia and ramollissement, or else destroyed or wasted away. It is chiefly on these various lesions that the symptoms observed in persons whose brain contains tubercles depend;

for, when they do not occur, tubercles have often existed in the nervous centres, especially in children, without producing any symptoms that could be referred to the state of those centres, and their existence was not suspected till they were discovered on dissection. In other cases, the symptoms intermit; which may be accounted for by the intermittence of the lesions of the surrounding parts. Thus, a tubercle does not of itself produce convulsions, but only predisposes to them by the periodic congestion it excites in the surrounding cerebral substance.

ARTICLE IV.

SCIRRHOUS AND ENCEPHALOID PRODUCTIONS.

I HAVE nothing particular to observe with regard to these productions as they exist in the nervous centres; since they have the same characters and disposition there as every where else. They usually occupy a considerable extent, the greater part of a cerebral hemisphere, for instance, or perhaps almost the whole of one of the lobes of the cerebellum; and are sometimes developed in the investing membranes of the nervous centres, and thus compress the latter more or less. Similar productions are often

developed in other organs at the same time.
The cause that influences the formation of these
productions in the nervous centres, is as little
known as that which produces them elsewhere.
However, in these parts, as in the breast or the
liver, we can sometimes trace them to an exter-
nal injury. There is a remarkable case of this
description to be seen in the *Revue Médicale* for
1826, (vol. i. p. 137.)

ARTICLE V.

FATTY PRODUCTIONS.

WE learn from chemical analysis that the
brain naturally contains various fatty substances.
Perhaps some of these, either secreted in super-
abundant quantity, or altered in quality, are the
origin of those morbid productions composed of
fatty matter that are occasionally found in the
nervous centres. One of these, found by Dr.
Leprestre in the brain of an adult, assumed the
form of a large tumour composed of concentric
layers united together by laminæ of cellular tis-
sue; its density was greater than that of the
brain, and it exactly resembled a mass of adipo-
cire. Another, found by M. Dalmas in the
brain of a young girl, was of the size of a hen

egg, and in its physical properties was not un-
like spermaceti : on analysis, it was found to
consist of a large quantity of fatty matter, and
another matter that seemed to be cholesterine.
This is the more remarkable, as Gmelin has
lately stated that the human brain naturally
contains a certain quantity of the latter sub-
stance.

ARTICLE VI.

FIBROUS, CARTILAGINOUS, AND OSSEOUS PRODUC-
TIONS.

THESE various productions are generally de-
veloped around the nervous centres, in their
investing membranes. Thus, fibrous tumours
often grow up from some point of the dura
mater, acquire a considerable bulk, and thus
produce a greater or less degree of compression
of the brain. They are sometimes situated at
the base of the cranium : I once saw one as
large as a hen egg resting on one of the temporal
fossæ. In other cases, they are situated at the
roof, the walls of which are then often destroyed,
so that the tumour appears externally.

Large cartilaginous or osseous plates are not
unfrequently found in the meninges ; but these

have been already treated of. The tentorium cerebelli has been occasionally seen thus completely ossified.

Similar productions may also appear in the substance of the nervous centres. I once found in the centre of one of the cerebral lobes, a fibrous tumour nearly as large as a walnut, exactly resembling those of the uterus; there was an apoplectic coagulum near it. No other symptoms had been observed during life, than those that usually accompany cerebral hæmorrhage.

ARTICLE VII.

ENTOZOA.

ONLY two kinds of entozoa have as yet been observed in the nervous centres of the human subject, namely, acephalocysts, and cysticerci. The former have occasionally been observed both in the substance of the brain, and in that of the spinal cord. I found some of the latter myself in the brain of a middle aged man, where they occupied chiefly the convolutions of the hemispheres; the intermediate cerebral substance was sound. M. Calmeil also found some cysticerci in the brain of a man aged forty-seven, who had been addicted to excesses of every kind,

and who, after having been treated with mer-
cury for syphilis, was seized with mania and
febrile delirium, and died in that state.

In the brains of animals, other entozoa are
occasionally found ; the one that is best known
is the polycephalus, which frequently occurs in
sheep, and is considered as the most common
causes of the disease called the staggers to which
those animals are subject.   M. Dupuy found
one of them in the middle of the lumbar por-
tion of the spinal cord of a lamb ; the only
symptom observed had been paraplegia.

SECTION II.

DISEASES OF THE CEREBRAL AND SPINAL NERVES.

PATHOLOGICAL anatomy is as yet by no means rich in facts relating to the alterations of the nerves. In many cases in which they have evidently been the seat of the disease, there is no lesion discoverable in them on examination after death. I have frequently examined the nerves with the greatest care in cases of sciatica, both recent and long standing, and have never been able to discover the least alteration in them, except in one case, in which the nerve which had been the seat of the pain was perceptibly injected. In a woman who, during the last months of her life, had constantly had severe pains, apparently resulting from neuralgia, in the nape and left side of the neck, I minutely examined the nerves of the bronchial and cervical plexuses, in their trunks and branches, without being able to find any thing particular. I have the same to say for several cases of rheumatic pains; as also for some of saturnine colic, where there was paralysis of the superior extremities. Lastly, in the epidemic that prevailed

at Paris the whole of the summer of 1828, in which one of the predominant symptoms was an exaltation, succeeded by a greater or less diminution, of the sensibility of the hands and feet, although there were some dissections made, there was no lesion that I know of discovered in the nerves of the limbs except in one case which I saw myself. Even in this one case, the lesion consisted merely in a more than ordinary redness and degree of injection .in the trunk of one of the sciatic nerves, while its branches were as white as usual, although it was in their extremities the pain was seated ; besides, both feet were equally affected, and only one sciatic nerve was red.

Notwithstanding this, however, we are occasionally able to detect some remarkable lesions of the nerves, which I shall now proceed to consider.

CHAPTER I.

Lesions of Circulation.

HYPERÆMIA of the nerves has been artificially produced in animals by several experimenters. The puncturing and bruising of a nerve, or even the exposure of it to the air, produce a redness of its tissue ; and the follow-

ing effects are then observed to ensue. In the first place, the vascularity appears to exist chiefly in the small neurilematous tubes; as is easily shown by macerating the nerve in a very dilute alkaline solution, which dissolves the nervous pulp, while the neurilema, remaining uninjured, is the more easily observed. However, in cases of hyperæmia of the nerves produced by disease, the nervous substance itself is also injected, as appears from the following case related by Reil: in a man who died of typhus, and who had experienced very severe pains in his nerves, the latter were found strongly coloured with blood; and the neurilema having been destroyed by nitric acid, the nervous pulp was found to be yellow; so that the blood must have penetrated into it, and imparted its colour to it.

When a certain time has elapsed after the production of the artificial irritation in the nerve, its substance is found to be yellow, instead of being red as it was at first. Beclard squeezed the pneumo-gastric nerves of a dog with a pincers so as to bruise them slightly; and on the death of the animal, which occurred in twenty-four days afterwards, one of the nerves was found somewhat swelled, and of a yellowish white colour, in the injured part, and slightly injected above and below it. The other

nerve presented a more considerable swelling, and was more strongly injected above and below it, but had not the yellow tint.

When a greater degree of irritation is produced in the nerve, the hyperæmia is increased, and the nerve converted into a cord of a deep red colour and spongy texture, in which we can no longer distinguish either the medullary substance, or the neurilematous sheaths. It is a remarkable circumstance in this experiment that, if, when baring the nerve and exposing it to the air, we do not take care to detach it from the surrounding parts, and even to isolate its fasciculi, it undergoes but very little alteration; the investing cellular tissue becomes congested, pus forms in it, and the nerve remains almost unaltered in the midst of the pus, or, at most, its surface becomes red, or some vessels have penetrated into the cellular tissue that separates the various portions of its fibres.

Hyperæmia of the nerves, arising from morbid irritation, is occasionally observed in the human subject. Recent researches on this subject, especially those of M. Martinet, have proved that, while, in many cases of neuralgia, the nerves that had been the seat of the pain are found after death in the natural state, there are others in which they presented a very evident vascular injection; but still they have

not proved that in such cases the injection preceded the pain. M. Martinet is of opinion, however, that the pains in the nerves that are accompanied by hyperæmia and other lesions appreciable in the dead body, differ from those connected with *essential* neuralgia in this, that in the latter the pain is not always increased by pressure, that it is variable in its nature, and that it is subject to remissions, whilst in *neuritis* the reverse is the case. I am inclined to think that if we were to trust too much to these diagnostic signs, we should often be led to mistake *neuralgia for neuritis*, and *vice versâ*. But, there is another character, which, when present during life, is an infallible indication of a considerable state of hyperæmia of the affected nerve, and that is, its tumefaction, so that its course can be traced beneath the skin. M. Martinet observed two instances of this increase of bulk, in the cubital nerve, which was as thick as the little finger, and resembled a cord stretched along the arm. The principal symptoms observed were severe pain along the course of the affected nerve, and convulsive movements, succeeded by paralysis, in the muscles to which its branches are distributed : a cure was effected in both cases. In a man who, after running for a long time, was attacked with violent pains in the back of both thighs, along the course of the

sciatic nerves, M. Martinet found those nerves remarkably red, enlarged, and firm. Their fibrillæ were penetrated by a number of blood-vessels, and infiltrated with a serous fluid tinged with blood. In another individual affected with sciatic pains that were increased by motion and pressure, he found the sciatic nerve of a violet colour, with fluid blood interposed between its fasciculi. M. Goupil observed a similar alteration in the crural nerve, in a case in which there had been violent pain along the course of that nerve during life. The patient died of peritonitis ; but before being attacked by it, he was in a state of slight febrile action, which, as well as the pain, was increased towards evening. M. Gendrin, likewise, has mentioned several interesting cases of hyperæmia of the sciatic nerve, observed in persons who had presented signs of neuralgia during life. The alterations he found were similar to those already described.

In a few cases, the nerves distributed to parts affected with chronic irritation have been observed to sympathize with them, and to fall into a chronic state of hyperæmia. In a case of old varicose ulcer of the leg, M. Gendrin found the saphena nerve at least three times as thick as usual, friable, and strongly injected ; it was also traversed by a multitude of varicose vessels.

It would appear from some recent researches that by artificially producing a hyperæmia in the nerves that influence certain organs, we can produce a similar affection in those organs themselves ; but we have not yet sufficient data to be able to come to any definite conclusion on this subject.

We have seen, in a preceding paragraph, that a slight irritation created artificially in a nerve occasionally produces a yellow colour in its tissue. The same yellow colouring was the principal lesion observed in a very remarkable case, where its presence in the fifth pair of nerves was attended by the various phenomena which M. Magendie produced in animals by the section of that pair. We are indebted for this case to M. Serres, and, whatever be our opinion as to the connexion between the alteration found in the nerve, and the symptoms observed during life, I think it well worth relating.

Joseph Hubertin, aged twenty-six, entered the hospital of *La Pitié* on the 29th September, 1823. He had then been subject to epilepsy for two years, and the fits were constantly preceded by convulsions of the right side ; he had, besides, chronic ophthalmia of the right eye, which became acute towards the month of December ; an incipient opacity of the cornea of that eye was then observed, which, though the ophthal-

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mia disappeared, continued to increase, so as at last altogether to obstruct the vision. In the month of January, the same eye lost its sensibility. During all this time the epileptic fits and the convulsions of the right side were as frequent as before, and the health of the patient gradually diminished. Between the 15th and 20th of June, the gums became inflamed, first in the upper jaw, and afterwards in the lower. During the month of July, the affection of the gums increased, they became puffy, and assumed a scorbutic appearance; the natural motions of the jaw and cheeks were not in any way altered.

On the 1st of August, the following experiments were tried on this patient in presence of a number of pupils.

The right eye was rubbed with the feather of a pen; the patient did not feel it, nor did he wink; the internal surface of the eyelid was equally insensible. The same experiment, when tried on the left eye, produced a strong sensation in it, and made him wink repeatedly. A feather was next introduced into the right nostril, and stirred about in every direction, without the patient's feeling it at all. On doing the same with the left, the strongest sensibility was immediately manifested. A bottle containing *liquor ammoniæ*, when held under the right nos-

tril, scarcely produced any sensation after a strong inspiration, while it could not be endured for a moment at the left.

On passing to the mouth, it was observed that the gums were much more affected at the right side than at the left ; but the tongue did not appear to be altered, and the patient was able to put it out in a straight line. On the application of sulphate of quinine to its right side, the patient neither felt nor tasted it, but immediately spit it out when applied to the left, complaining that it was insupportably bitter.

The patient retained his sense of hearing at both sides until the 3d or 4th of August, but about the 5th or 6th he became almost deaf at the right side. A blister was immediately applied to the nape of the neck, and on the 7th, 8th, and 9th, the deafness diminished, but the health of the patient declined rapidly, and he died on the night of the 11th.

On examining the body, the dura mater was found detached from the right sphenoid fossa. The ganglion of the right nerve of the fifth pair was in a singular state, being puffy, of a yellowish grey colour, and having its granulations separated from each other by a small quantity of serum. The portion of it that gave off the ophthalmic nerve was red and injected, as was also the dura mater above it. The trunk of the

nerve behind was as yellow as the ganglion
itself, for an extent of about two lines ; but it is
to be remarked that the narrow anterior fasci-
culus which passes under the ganglion was per-
fectly sound throughout. The three branches
given off by the ganglion were also yellow as
long as they continued within the cranium, after
which the two first assumed the natural appear-
ance, but the third or inferior maxillary was
found to be puffy and yellow, even in the zygo-
matic fossa. Here, the part which gave off the
inferior dental, the lingual, and the auricular
nerves still preserved the yellow colour of the
trunk ; while the part which furnished the deep
temporal, the pterygoid, the masseteric, and the
buccal nerves, was as free from alteration as
the corresponding part at the opposite side. On
being traced backwards, it was found to be the
continuation of the sound fasciculi that passed
beneath the ganglion, as already mentioned.

Neither the internal bones nor the nerves of
the right ear presented any appreciable altera-
tion. At the right side of the *tuber annulare*,
where the nerve of the fifth pair arises, there
was a yellow gelatinous mass, resembling that
found at the part of the nerve that was situated
on the upper edge of the petrous portion of the
temporal bone. Inside this were two small
white fasciculi which could be traced to the

superior margin of the medulla oblongata, and were found to be the continuation of the filaments that passed beneath the ganglion. At the left side, the nerve of the fifth pair was sound.

Besides this, the left hemisphere of the brain was softened, and somewhat yellow at its superior surface ; and the thalamus opticus and corpus striatum of the same side were softer than those of the opposite side ; the left hemisphere of the cerebellum presented similar alterations, though in a less degree.

CHAPTER II.

Lesions of Nutrition.

ARTICLE I.

HYPERTROPHY.

BICHAT thought he observed that the nerves of parts whose nutrition is altered, and especially of such as have become cancerous, were themselves in a state of hypertrophy ; and other authors have made the same remark. This, however, is a point about which one might

easily deceive himself, as we often readily see what we try to see; therefore it would be a good plan not to pronounce any nerve to be hypertrophied, without first comparing it with the same nerve in another subject. Still, I think there are many cases in which such an alteration of the nerves has been clearly ascertained; in proof of which I shall mention the two following.

Case I. In an old man who had an extensive chronic ulcer on one leg, the nervus saphenus was at least three times as thick as usual in that portion of it that was contiguous to the ulcer, and gave off a number of filaments, also thickened and injected, which were lost in the parietes of the varicose branches of the vena saphena, as well as in the indurated tissue of the margin and bottom of the ulcer. It was found gradually to resume its ordinary bulk in proportion to the distance from the ulcer at which it was examined. (Gendrin.)

Case II. A woman had on one of her legs a fungous ulcer of long standing, in which she constantly suffered severe pains, which always increased at night. It was found necessary to amputate the leg; and, on examining it afterwards, the peroneal nerve was observed to have become much larger below than above, and to give off several branches which were also singu-

larly thickened. Both this nerve and the anterior tibial were surrounded by a dense cellular membrane, which was exceedingly vascular. The skin and the bones were also in a remarkable state of hypertrophy, while the muscles, on the contrary, were almost completely wasted away.*

There are sometimes found in the nerves partial tumefactions of their substance, which appear to result merely from circumscribed hypertrophy. A remarkable instance of this was observed in a *cretin*, aged thirty-three, whose body was examined by Dr. Schiffner of Vienna. The inferior maxillary nerve presented swellings as large as peas in all its branches ; and the portio dura of the seventh pair, the eighth pair, and almost all the spinal nerves, were similarly affected.†

ARTICLE II.

ATROPHY.

ATROPHY of the nerves is seldom found except in cases where the parts to which they were distributed had themselves undergone a

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* Swan. *Observations on some Points relating to the nervous System.*
† *The London Medical and Physical Journal*, 1826.

diminution in the activity of their natural nu-
trition, or of their functions ; and is principally
observed in the optic nerve.

In the greater number of cases where an eye
has long lost the power of vision, we find re-
markable changes in the structure of the optic
nerve. In some of these cases, undoubtedly, the
primary lesion was in the nerve itself; but these
are the least numerous, the lesion of the nerve
being generally consecutive. Thus, it is found in
persons whose blindness was owing to a nebula
or a cataract, as also in cases where the eye had
been destroyed by some external injury ; and
the longer the eye has lost its sight, the more
considerable is the alteration of the optic nerve.

Atrophy of the optic nerve presents the fol-
lowing characters. Its bulk is diminished, so
that it is sometimes reduced to a third, a fourth,
or a fifth of its natural size ; and its medullary
substance disappears, leaving in the interior of
the nerve a grey semitransparent substance. In
many cases, according as the nervous substance
thus disappears, the neurilema acquires greater
thickness and consistence, which gives the nerve
the appearance of a fibrous or almost cartilagi-
nous cord : in other cases, nothing of the kind oc-
curs, and, instead of the nerve, we merely find
a membranous sheath, with thin, transparent
parietes, and containing a semifluid cellular

substance. As the bulk of the nerve diminishes, the foramen opticum also becomes contracted ; just as the orbit itself tends to become effaced in cases of considerable atrophy of the globe of the eye.

This affection is observed much more frequently in the portion of the nerve between the eye and the commissure, than behind that point; but, when it does continue behind it, it is always in the nerve that goes to the thalamus opticus of the other side, thus demonstrating the fact of the intersection of the optic nerves. As to the thalami, they are very seldom altered, even when the optic nerves are in the greatest possible state of atrophy. On the other hand, it is a remarkable fact, that blindness is seldom produced by any of the various and frequent alterations of the thalami.

Atrophy of the optic nerve sometimes takes place but very slowly after the loss of sight of one eye. I have in many instances found no appearance of it in persons who had been blind for several years ; and Magendie found it scarcely observable in a girl who had been blind of an eye for seven years. In other cases, on the contrary, the atrophy occurs in a short time. It appears from some experiments of Sœmmering's and Magendie's, that it takes place more rapidly in the mammalia, and still more so in birds ; as

if the rapidity of its occurrence were in propor-
tion to the keenness of the sight previously pos-
sessed.

When the optic nerve becomes affected with
atrophy, the retina must likewise share more or
less in the affection ; and it is an extraordinary
circumstance, that an accidental osseous pro-
duction is then often found interposed between
it and the choroid.

Complete absence of the optic nerves has
been observed in infants born without eyes,
although in many cases of this description the
thalami optici and the tubercula quadrigemina
presented the natural conformation. In like
manner, it has been observed that in cases
where the nasal fossæ were wanting, the olfac-
tory nerves did not exist. In a dog that had
cyclopia, dissected by M. Magendie, there was
no trace of an optic nerve to be found, although
there was a retina ; so that the formation of the
latter is apparently independent of the existence
of the former. However, in many other cases
of cyclopia, the optic nerve has been found,
either single or double.

It has not as yet been sufficiently ascertained
whether the auditory nerve is subject to the same
affection in cases of deafness. The roots of the
spinal nerves have often been found to be smaller
than usual in cases of paralysis : the nerves of

the affected limbs themselves have also been ex-
mined, but no diminution could be detected ;
indeed, in some cases, it seems they were even
found to be larger than the corresponding
nerves of the sound limbs, and at the same
time, to have acquired a yellow tinge.   This
however might have arisen, not from any in-
crease of the medullary substance, but merely
from the thickening of the neurilematous sheath,
or from the infiltration of a fluid.   As far as my
own experience goes, I have never found the
nerves of paralytic limbs in a state either of
atrophy or hypertrophy.

Atrophy of the nerves may likewise be me-
chanically produced by their compression by tu-
mours of various kinds formed around or conti-
guous to them.   I saw a case where the pneu-
mogastric and phrenic nerves were thus com-
pressed and atrophied by a cancerous tumour ;
the result of which had been a considerable em-
barrassment of the respiration, which had in-
duced us to suppose there was an organic dis-
ease of the heart.*   The optic nerves have been
frequently found deformed, atrophied, or re-
duced to a membranous sheath by the presence
of various accidental productions.   A remark-
able case of this kind occurred lately at the *Hôtel-*

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* *Clinique Médicale.*

Dieu. An osseous cyst as large as a nut was found on the *sella turcica,* resting on the commissure of the optic nerves, of which latter there was not a vestige to be found except in the orbits. The individual in whom this was found had been affected with total blindness, complicated with violent cephalalgia. However, he used to recover his sight in a small degree from time to time. Now, how are we to reconcile this with the account of the state of the optic nerves? It can only be done by supposing them to have been atrophied, but not completely destroyed; or else to have escaped observation by being expanded over the surface of the cyst, like the nerves around an aneurismal sac.

There is in the *Journal de Physiologie de M. Magendie* for January, 1825, a case of the complete disappearance of the olfactory nerves in consequence of their compression by a mass of tubercle developed at the base of the brain. At the same time, the optic nerves appeared to be hollow, which probably depended on the extreme degree of ramollissement of their medullary substance; their commissure was also softened. The patient had been for two years affected with complete amaurosis, together with supra-orbital cephalalgia. Like the subject of the preceding case, he had once a return of his sight, but it was only momentary. Another re-

markable circumstance in this case is, that though the olfactory nerves appeared to be completely destroyed, the patient had retained the sense of smell, like the animals upon which Magendie tried the experiment of cutting the same nerves, leaving untouched those of the fifth pair.

There is another very remarkable case of atrophy of a nerve published by M. Billard, in the sixth volume of the *Archives de Medecine*. In this case, the facial nerve was the one affected, its trunk and several of its branches having completely disappeared in a lardaceous tumour that occupied the parotid region. It is the more important, too, as the phenomena observed during life were similar to those produced in animals by Charles Bell, by cutting the facial nerve; that is to say, the sensibility was retained, and the power of moving lost.

CHAPTER III.

Lesions of Secretion.

WHEN a nerve is in a state of hyperæmia, we often find in it various morbid secretions which separate its filaments or occupy their place. They may be either fluid or solid. The

fluids are blood, serum, or pus. The sangui-
neous infiltration of the nerves has been already
described in one of the preceding articles; while
their serous infiltration has long since been
pointed out by Cotunni, who assigned to it an
important part in the production of neuralgia,
having observed it in the sciatic nerve, in a case
where that nerve had been the seat of severe
pain.

Suppuration of the nerves has been describ-
ed by M. Martinet and M. Gendrin, who have
both related cases of it observed in individuals
who had had severe pains along the course of a
great nerve. In one of those mentioned by M.
Martinet, the pus was situated only in the inte-
rior of the nerve (which was the sciatic); in
another, there was a copious suppuration around
the nerve (which was also the sciatic) and but
a small quantity infiltrated between its fila-
ments. During life, all the symptoms of scia-
tica had been observed: the patient was a child
twelve years old.

There is in the fiftieth volume of the *Journal
Général de Medecine* a case of suppuration of the
optic nerve. The nerve appeared sound exter-
nally; but, internally it was filled with a puri-
form matter of a dirty white colour from the
commissure to the globe of the eye. The sub-
ject of the case was a man aged forty, who died

at the *Hotel-Dieu* of an adynamic fever. For the six last months of his life he had lost the use of the left eye ; the blindness had come on slowly. He had also been long subject to violent headachs. The eye appeared to be sound, and the iris was perfectly moveable.

The solid accidental productions found in the nerves consist of tumours of various forms, sizes, and textures, which present the characters of those productions denominated encephaloid, tuberculous, scirrhous, &c.

There are few nerves in which such tumours have not been observed. I shall now proceed to enumerate their principal varieties.

In the first place, there have been found, on the different nerves of the extremities, tumours varying in size from that of a grain of millet to that of an orange, which are hard and exceedingly painful, especially when pulled in the direction of the course of the nerve. When examined after death, they are found to be composed of a hard substance, resembling scirrhus or cartilage ; but it is not the tissue of the nerve itself that is transformed into this substance, its filaments being only divided by it, and spread around it like bands. Other tumours consist of a mass of small cysts containing a jelly-like matter ; and others of a single cyst of greater size, containing various kinds of matter, and having

parietes of a fibrous or cartilaginous texture. A single nerve may present several such tumours, which then resemble ganglions. M. Dupuytren met with a singular case of this description. On removing a small cancerous tumour from the leg, he perceived that it had occupied only the posterior tibial nerve, which presented a series of nodules like grapes.

Similar tumours to those just described have been found in most of the nerves of the extremities. M. Dupuytren found one as large as a walnut in the infra-orbitar nerve, in the *fossa canina*. In another case, he found the nerve of the fifth pair transformed into encephaloid matter. Others have seen schirrous tumours in that nerve.

In a man who lost the sight of his left eye for two months before his death, there was found in the centre of the optic nerve a small hard tubercle of a greyish colour, and somewhat larger than a grain of hemp. M. Berard saw a case where the right phrenic nerve appeared to have its continuity interrupted by a blackish tubercle, as large as a pea, and of a scirrhous consistence. On dissecting this tubercle, there were some whitish streaks perceptible in it which seemed to keep up the continuation of the medullary substance ; but the fact was not quite evident. The subject of the case had presented

the symptoms of asthma ; and, on dissection, there was no lesion discoverable in the lungs except a slight degree of emphysema. Lastly, in an individual affected with elephantiasis, Professor Nægele found the tibial nerve of the affected limb larger than usual, especially towards its inferior portion, and studded both on its surface and in its interior with round or oval nodules, which proved to be so many small cysts containing a fluid that was limpid in some parts and thick and turbid in others. Nervous filaments were found terminating in the superior and inferior parts of each nodule, and others, investing it ; but there was no trace of nervous substance in its interior.*

There are sometimes developed in the sub-cutaneous cellular tissue small tumours of a roundish, lenticular, or flattened form, and great hardness, which have been improperly confounded with those tumours I have just described. In fact, though they resemble them in the circumstance of their being generally painful, they are completely different in their nature ; since, on examination, it is easy to see that they are not developed in the substance of any nerve, but have merely some nervous filaments occasionally agglutinated to them. They

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* *Archives de Medecine*, vol. XIII. p. 431.

are generally composed of a fibro-cellular or fibro-cartilaginous tissue, but have sometimes no trace of organization, and appear completely scirrhous. They are always enclosed in a dense, opake, cellulo-fibrous envelope, which compresses them more or less, and may thus contribute to the production of the severe pain experienced in them. Their bulk varies from that of a grain of wheat to that of a horse bean. M. Dupuytren, who was one of the first to distinguish these tumours from those formed in the nerve itself, has found them not only under the skin, but often in other parts also, as, for instance, in the breasts, where they produced insupportable pain.

SECTION III.

DISEASES OF THE SYMPATHETIC NERVE.

FEW lesions appreciable to anatomy have been hitherto detected in the ganglionic nervous system. I have often examined it carefully in individuals that had died of various diseases, and have but in two instances discovered any alteration in it, and that was merely a strong redness of the semilunar ganglions. In both in-stances there had been *ataxic* symptoms during life ; and in one of them the patient had died in a state of tetanus.* All that is known of the pathological anatomy of this system may be re-duced to the following facts.

M. Lobstein † has observed two cases of red-ness of the semilunar ganglions. The subject of one of these was a young woman who had been subject to constant vomitings for several months before her death. The stomach and intestines were sound ; but the semilunar gang-

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* *Clinique Medicale.*

† *De nervi sympathetici fabricâ, usu et morbis,* auctore J. F. Lobstein, p. 117.

lions were intensely red. The subject of the other was a female infant six months of age, who died in the course of a hooping cough attended with vomitings and convulsive motions : the right half of the solar plexus was very red.

Dr. Aronssohn found the semilunar ganglions highly injected in a man that died of tetanus. He found them in the same state in an individual who died after suffering for three years from vomitings and diarrhœa.

M. Lobstein also states that, on examining the body of a child of ten years of age, that died in a state of great dyspnœa subsequent to the disappearance of a miliary eruption, he found the ninth and tenth thoracic ganglions in an inflammatory condition ; but unfortunately he has not described what that condition was. In another instance, he observed that one of the principal cardiac nerves was red, tumefied, and softened ; the subject was a woman who had died of phthisis.

In these various cases, the lesion consisted chiefly in hyperæmia of the ganglions or their nerves ; but there are others in which those parts have been found in a state of hypertrophy. Thus, M. Lobstein states that he observed the nerves that form the suprarenal plexus to be much larger than usual, in an individual in whom the renal capsules themselves had ac-

quired an unusual bulk, and become tuber-culous*

Dr. A. Duncan † mentions a case of diabetes, in which the sympathetic nerve was evidently three or four times as large as usual from its entrance into the abdomen, to its termination near the pelvis.

In the cretin whose cerebral and spinal nerves presented the remarkable appearance described in the second chapter of the preceding section, Dr. Schiffner ‡ found that the ganglions of the great sympathetic situated along the ver-tebral column were much larger than usual. Opposite the sixth vertebra, the sympathetic nerve of the left side had a ganglion as large as a hen's egg flattened. M. Cayre, in a thesis on idiotism supported in 1819, had already stated that he observed the ganglionic system preter-naturally developed in a case of congenital idiotcy, the cervical ganglions being three times as large as usual, and the thoracic and semilu-nar ganglions being also beyond the natural size. ‖

To conclude, a state of hypertrophy of one

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* *Traité d'Anatomie pathologique.*

† *Reports of the Practice in the clinical Wards of the Infirmary of Edin-burgh,* 1818.

‡ *Archives de Médecine,* vol. II.

‖ Belhomme, *Essai sur l'Idiotie* (Thesis de 1824.)

of the cervical ganglions, almost similar to that described by Schiffner, has been represented by M. Cruveilhier in one of his beautiful plates on the subject of pathological anatomy.*   The cervical ganglions were much more developed than usual, so as to form large tumours, which were at first taken for diseased lymphatic glands. These tumours appeared to consist almost wholly of fibrous tissue ; so that in this case the various anatomical elements of the ganglions did not all present an excess of nutrition, but only their cellulo-fibrous tissue, the nervous substance being rather in a state of atrophy.   It is to be regretted that we have no information as to the symptoms observed.

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* *Planches d'Anatomie Pathologique*, &c., 1re Livraison.

THE END.